

TETRA TECH, INC.

## TECHNICAL MEMORANDUM

Basewide Groundwater Monitoring Program Report  
Summer 2005  
Installation Restoration Program Site 2  
Vandenberg Air Force Base, California

07 December 2005

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## **1.0 INTRODUCTION**

This report documents the activities and results of the summer 2005 groundwater monitoring at Installation Restoration Program Site 2 (Old Base Service Station, or OBSS), Operable Unit 6, Vandenberg Air Force Base (AFB), Santa Barbara County, California. Samples were collected at Site 2 by Tetra Tech, Inc. (Tetra Tech) during August 2005. The location of Site 2 is shown on Figure 1.

The groundwater monitoring is being completed in accordance with the Basewide Groundwater Monitoring Program (BGMP) Work Plan (U.S. Air Force 2000a), the BGMP Health and Safety Plan Addendum (U.S. Air Force 2000b), the Basewide Sampling and Analysis Plan (U.S. Air Force 2003), the BGMP Quality Assurance Project Plan (QAPP) Addendum (U.S. Air Force 2004a), the Vandenberg AFB Hazardous Waste Management Plan (U.S. Air Force 2002), and the Waste Management Plan Addendum (U.S. Air Force 2005a). Regulatory oversight of the work is being performed by the California Department of Toxic Substances Control (DTSC) and Regional Water Quality Control Board—Central Coast Region (RWQCB).

Site background information is summarized in Section 2.0. The scope of work and methodology for groundwater monitoring are presented in Section 3.0. The results of the quarterly monitoring are presented in Section 4.0. Quality Assurance/Quality Control is discussed in Section 5.0. Recommendations for future sampling are presented in Section 6.0.

## **2.0 BACKGROUND**

### **2.1 SITE DESCRIPTION AND HISTORY**

Installation Restoration Program Site 2 is located in the main cantonment area, north of the intersection of Wyoming and Summersil Avenues. In early 2000, a Tee-Ball field was constructed that covers the majority of the Site (Figure 1). The Child Development Center playground is located to the northeast.

The OBSS had a service station building and three pump islands on a 200-foot by 200-foot asphalt lot. The site had four 10,000-gallon gasoline underground storage tanks (USTs), a 500-gallon aboveground waste oil tank, and an oil/water separator. The OBSS dispensed leaded and unleaded gasoline from 1941 until 1981.

All structures, tanks, and piping associated with the OBSS were removed between 1981 and 1998 (HydroGeoLogic [HGL] 2001). All four gasoline USTs, which were located at the northwest corner of the site, were removed in 1981. In 1992, Jacobs Engineering Group, Inc. (JEG) removed the concrete oil/water separator and fuel distribution piping (HGL 2001). In 1998, the 500-gallon waste oil tank was removed. During the removal of the OBSS building, the pump islands, and the pavement in 1998, monitoring wells 2-MW-2, and OS-MW-4 reportedly were destroyed and wells OS-MW-3A and OS-MW-2 were damaged (HGL 2001).

In 1999, IT Corporation, Inc. (IT) began investigations at the site. In September 1999, IT conducted a shallow soil investigation. HGL continued the investigation and, in November 1999, removed 170 cubic yards of soil below the former location of the two easternmost pump islands (along the southern portion of the site) (HGL 2001). The Tee-Ball field was built several months after completion of the excavation activities (Martinez 2001).

During the construction of the Tee-Ball field and the realignment of Wyoming Avenue and Utah Avenue, monitoring wells 2-MW-5 through 2-MW-9, OS-MW-3A, and OS-MW-4 were buried under fill material. Wells 2-MW-5 through 2-MW-9 were subsequently found and are not damaged. In September 2000,

Tetra Tech was requested to determine the condition of wells OS-MW-2, OS-MW-3A, and OS-MW-4. Well OS-MW-2 was found and was determined to be undamaged. Tetra Tech was unable to find monitoring wells OS-MW-3A and OS-MW-4 due to the amount of fill material covering them. The condition of these wells is unknown; however, it appears likely they have been destroyed. In a letter dated 06 February 2001 the Air Force recommended no further search for these wells. The RWQCB concurred with this recommendation in a letter dated 15 March 2001.

In February 2002, Tetra Tech installed a remote sampling system for wells 2-MW-5, 2-MW-7, 2-MW-8, and 2-MW-9 at Site 2. The system was designed to facilitate quarterly sampling of these wells, which are buried under the Tee-Ball field, without delaying use of the Tee-Ball field or impacting the condition of the grass on the field or surrounding grounds.

The remote sampling system was installed with watertight well caps and continuous tubing. The static water levels of these wells are measured using a pressure transducer that calculates the height of a water column above an open-ended tube suspended in the casing. The pressure transducer is zeroed to ambient pressure before the first reading is taken. Since the wells are sealed to prevent surface water intrusion, the air inside the casings is no longer at ambient pressure. For this reason the static water levels measured by the remote sampling system may be different from what is measured by the pressure transducer.

## **2.2 HYDROGEOLOGY**

Site 2 is located on Burton Mesa, where groundwater typically occurs unpredictably in small lenses perched on low-permeability layers. At Site 2, groundwater is encountered in apparently discontinuous perched lenses in the unconsolidated sediments overlying Monterey Formation bedrock and, more importantly, in fractured cherts and porcelanites (HGL 2001). Groundwater occurring in this fractured zone within the Monterey Formation represents the groundwater monitoring network sampled under the BGMP at Site 2.

Groundwater depths range from 14 to 31 feet below ground surface. However, groundwater was encountered during drilling at approximately 10 feet below the static level measured in the monitoring wells (HGL 2001).

Groundwater levels measured in August 2005 indicate that the groundwater elevation ranged from approximately 451 to 454 feet above mean sea level (Table 1). Based on data from this quarter, the interpreted direction of groundwater flow at Site 2 was to the northwest with an average hydraulic gradient of 0.007 feet per foot (Figure 1).

Monitoring wells at Site 2 are screened between 411.3 and 452.5 feet above mean sea level (U.S. Air Force 2004b). According to the Supplemental RI Report completed by HGL, the deep groundwater zone occurs below lenses of relatively impermeable material. The boring logs of monitoring wells sampled as part of the BGMP show groundwater encountered at depths below laminated mudstone, silty clay, or clay layers (HGL 2001). Therefore, the groundwater sampled as part of the BGMP is from the deep groundwater zone.

## **3.0 SCOPE OF WORK**

The work performed during summer 2005 at Site 2 included measuring groundwater elevations, collecting groundwater samples for laboratory analysis, and preparing this report.

### **3.1**

### **GROUNDWATER MONITORING METHODOLOGY**

Eleven wells were sampled at Site 2 during summer 2005. Dedicated MicroPurge pumps were used for purging and sampling groundwater at wells 2-MW-1, 2-MW-3, 2-MW-5, 2-MW-7 through 2-MW-12, OS-MW-1, and OS-MW-2. Duplicate samples were collected from wells 2-MW-1 and OS-MW-1. Sampling was conducted in accordance with the documents cited in Section 1.0. Measured groundwater elevations are presented in Table 1, and groundwater contours are illustrated on Figure 1. Purge records are provided in Appendix A.

In general, wells were purged until a minimum of one pump and tubing volume of water was removed and water quality parameters had stabilized. Criteria for determining stabilization are three successive measurements of temperature within  $\pm 1$  degree Celsius, pH within  $\pm 0.1$ , conductivity within  $\pm 5$  percent, and a turbidity reading of less than 5 nephelometric turbidity units (NTUs). In cases where stability or a turbidity reading of less than 5 NTUs was not obtained, samples were collected after purging a minimum of five pump and tubing volumes of water.

#### **3.1.1**

#### **MicroPurge Groundwater Sampling**

MicroPurge sampling was conducted at all monitoring wells sampled at Site 2 during summer 2005. The pumping rates were calibrated for each well prior to purging to maintain a static water level (i.e., minimal drawdown). Due to high turbidity, wells 2-MW-1, 2-MW-10, 2-MW-12, OS-MW-1, and OS-MW-2 were sampled after purging at least five pump and tubing volumes of water.

## **4.0**

## **RESULTS**

Temperature, conductivity, pH, and turbidity were measured during purging and sampling. Field parameter readings measured immediately prior to sampling are presented in Table 2. Fixed laboratory analyses were performed by EMAX Laboratories, Inc. in Torrance, California. Samples were analyzed according to the work plan (U.S. Air Force 2000a) for dissolved metals by U.S. Environmental Protection Agency (EPA) methods SW6010B and SW7470A, total petroleum hydrocarbons as gasoline (TPHg) by EPA method SW8015B, volatile organic compounds (VOCs) by EPA method SW8260B, semivolatile organic compounds (SVOCs) by EPA method SW8270C, and polynuclear aromatic hydrocarbons (PAHs) by EPA method SW8270C with selected ion monitoring (SIM). Laboratory analyses and data validation were conducted according to the QAPP Addendum (U.S. Air Force 2004a). Data validation was performed on 100 percent of the analytical data. Analytical results are presented in Tables 3 through 5 and on Figure 2. A historical summary of key contaminants of concern (COCs) is presented in Table 6 and on Figures 3A and 3B. Figure 3A contains historical data for key COCs from December 1999 through fall 2003 and Figure 3B contains historical data for key COCs from winter 2004 to present. Hydrographs showing historical benzene and naphthalene concentrations in groundwater from well 2-MW-8 are presented on Figure 4. Chain-of-custody records are provided in Appendix B.

### **4.1**

### **METALS**

Groundwater samples collected from eleven wells sampled at Site 2 this quarter were analyzed for dissolved metals. Dissolved metal concentrations were compared to the 95th percentile background threshold values (BTVs) for groundwater (JEG 1994) and primary maximum contaminant levels (MCLs).

Aluminum was detected above the BTV of 1,200 micrograms per liter ( $\mu\text{g/L}$ ) and the MCL of 1,000  $\mu\text{g/L}$  in groundwater from well 2-MW-8 at a concentration of 5,060  $\mu\text{g/L}$  (Table 3 and Figure 2).

Beryllium was detected above the BTV of 0.3 µg/L and the primary MCL of 4 µg/L in groundwater from well 2-MW-8 at a concentration of 6.81 µg/L. Beryllium was also detected above the BTV in groundwater from well 2-MW-7 at a concentration of 1.71 µg/L.

Cadmium was detected above the BTV of 5 µg/L and the primary MCL of 5 µg/L in groundwater from seven wells at concentrations ranging from 5.49 to 86.1 µg/L.

Selenium was detected above the BTV of 3 µg/L in groundwater samples from eight wells at concentrations ranging from 7.79 to 48.3 µg/L.

Thallium was detected above the BTV of 1 µg/L and the primary MCL of 2 µg/L in groundwater collected from seven wells at concentrations ranging from 5.48 to 9.77 µg/L.

In addition, arsenic, barium, calcium, chromium, cobalt, iron, magnesium, molybdenum, potassium, sodium, and zinc were detected at concentrations above their respective BTVs in one or more Site 2 wells, and dissolved nickel was detected above the MCL for nickel in groundwater from seven wells. The dissolved metals concentrations detected for metals key COCs during spring 2005 were within the range of those previously detected with the exception of the beryllium. Beryllium was detected in groundwater from well 2-MW-8 at a lower concentration than previously detected, and beryllium concentrations in this well have been steadily decreasing since winter 2002 (Table 6 and Figures 3A and 3B).

#### **4.2 TOTAL PETROLEUM HYDROCARBONS**

Groundwater samples collected from wells 2-MW-7 through 2-MW-9, OS-MW-1, and OS-MW-2 were analyzed for TPHg. TPHg were detected in groundwater from wells 2-MW-7 and 2-MW-8 at concentrations of 0.2 and 1.4 mg/L, respectively (Table 4). The TPHg concentrations detected in groundwater from well 2-MW-8 have been above the Leaking Underground Fuel Tank (LUFT) action level for TPH in groundwater of 1 milligram per liter (mg/L) every sampling round since the installation of the MicroPurge pump in winter 2002, and the overall trend has been towards decreasing concentrations (Table 6 and Figures 3A and 3B).

#### **4.3 VOLATILE ORGANIC COMPOUNDS**

Groundwater samples collected from wells 2-MW-3, 2-MW-7 through 2-MW-9, OS-MW-1, and OS-MW-2 were analyzed for VOCs. Benzene was detected above the primary MCL of 1 µg/L in groundwater from wells 2-MW-7 and 2-MW-8 at concentrations of 1.5 and 37 µg/L, respectively (Table 5).

The VOC 1,2-dichloroethane was detected above the primary MCL of 0.5 µg/L in groundwater from well 2-MW-8 at a concentration of 1.5 µg/L (Table 5). This VOC was also detected during the winter 2005 sampling round at this well at a concentration of 2.1 µg/L (U.S. Air Force 2005b).

Concentrations of benzene, ethylbenzene, toluene, and xylenes detected in groundwater from well 2-MW-8 increased significantly between fall 2001 and winter 2002, which coincides with the installation of the MicroPurge pump during winter 2002 (Table 6 and Figures 3A and 3B). Since winter 2002, ethylbenzene and o-xylene concentrations in well 2-MW-8 have remained relatively stable, while toluene concentrations have generally been decreasing. Concentrations of m,p-xylenes were within the ranges of those previously detected although they were on the lower end of that range. All of the benzene concentrations detected in groundwater from well 2-MW-8 since December 1999 have been above the MCL of 1 µg/L (Table 6). The hydrograph on Figure 4 illustrates an overall trend of increasing benzene concentrations in wells 2-MW-7 and 2-MW-8 and no apparent correlation with groundwater elevation. In

addition, benzene was detected above the MCL for the first time in well 2-MW-7 during summer 2005; however, benzene has not been detected in groundwater from downgradient well 2-MW-9 since December 1999, indicating the contamination is not moving downgradient. During the remedial investigation performed by HGL, BTEX were detected in deep and shallow soil samples collected from the vicinity of well 2-MW-8, and 170 cubic yards of soil were removed from the site in November 1999 (HGL 2001). However, the trend of increasing benzene concentrations in well 2-MW-8 and the first historic detection of benzene above the MCL of 1 µg/L in well 2-MW-7 suggest the continued presence of soil contamination in the vicinity of these two wells.

#### **4.4 SEMIVOLATILE ORGANIC COMPOUNDS AND POLYNUCLEAR AROMATIC HYDROCARBONS**

Groundwater samples collected from wells 2-MW-1, 2-MW-3, 2-MW-5, 2-MW-7 through 2-MW-9, OS-MW-1, and OS-MW-2 were analyzed for SVOCs. Groundwater samples collected from wells 2-MW-8 and OS-MW-2 were also analyzed for PAHs.

Naphthalene was detected in groundwater from well 2-MW-8 at a concentration of 16 µg/L using EPA method SW8270C for SVOCs and 11 µg/L using EPA method SW8270C with SIM for PAHs (Table 4). Groundwater collected from well 2-MW-8 also contained 2-methylnaphthalene at a concentration of 18 µg/L. In addition, bis(2-ethylhexyl)phthalate was detected in groundwater from well 2-MW-3 at a concentration of 14 µg/L; however, this compound is a common laboratory contaminant and the result is suspected to be due to laboratory contamination.

Naphthalene has been detected in groundwater collected from well 2-MW-8 since December 1999 at concentrations ranging from 1.07 µg/L (December 1999) to 28.8 µg/L (winter 2004) (Table 6). Naphthalene has been detected at concentrations above the California Department of Health Services (DHS) notification level of 17 µg/L during seven quarters since December 1999. The compound 2-methylnaphthalene has been detected in groundwater collected from well 2-MW-8 since summer 2001 at concentrations ranging from 5.7 µg/L (fall 2001) to 38.2 µg/L (winter 2004) (Appendix C). Concentrations of both compounds generally showed an increase until winter 2004. Between winter and spring 2004, concentrations of naphthalene and 2-methylnaphthalene decreased significantly, has generally increased again until spring 2005, and decreased slightly between spring and summer 2005 (Figure 4 and Appendix C: Figure C-1).

Although naphthalene and 2-methylnaphthalene are not classified as carcinogens by the U.S. EPA (U.S. EPA 2005), the State of California considers naphthalene a carcinogen. However, a benzo(a)pyrene potency equivalency factor (PEF) has not yet been established by the State of California and a benzo(a)pyrene PEF is not available for either compound (DTSC 1999). Therefore, the naphthalene and 2-methylnaphthalene results for groundwater from well 2-MW-8 have not been evaluated using PEFs.

#### **5.0 QUALITY ASSURANCE/QUALITY CONTROL**

All of the analytical data presented in this report have been validated according to the QAPP Addendum (U.S. Air Force 2004a). The data validation process includes review of sample preservation, temperature, and hold times; detection and quantitation limits; instrument calibration; and equipment blank, trip blank, method blank, laboratory control sample, and matrix spike/matrix spike duplicate. Data validation qualifiers and comments are provided on the data tables to indicate the results of the data validation and to quantitatively indicate the usability of the data. In addition, field sampling records are reviewed to assess the potential for any field conditions to adversely impact the data quality.

Zinc was qualified for blank contamination due to its presence in the associated method blanks. This discrepancy is considered minor and does not significantly impact the data quality or interpretations presented in this report. The data quality objectives for the summer 2005 sampling at Site 2 were achieved.

## 6.0 RECOMMENDATIONS

In the winter 2005 Groundwater Monitoring Report, Tetra Tech and the Air Force recommended PAH analyses be continued quarterly at well 2-MW-8 and semiannually during winter and summer quarters at well OS-MW-2. The RWQCB and DTSC concurred with this recommendation.

In the spring 2005 Groundwater Monitoring Report, Tetra Tech and the Air Force recommended that mercury be removed from the analyte list for metals at Site 2 beginning in fall 2005. The RWQCB and DTSC concurred with this recommendation.

Recommendations for the summer 2005 Groundwater Monitoring Report are presented below:

1. Tetra Tech and the Air Force recommend removing VOC analysis for well 2-MW-3, a cross-gradient well. Key VOCs have not been detected for more than four consecutive sampling quarters in groundwater from this well (Table 6 and Figure 3B).
2. Tetra Tech and the Air Force recommend that SVOC analyses at wells 2-MW-1, 2-MW-3, 2-MW-5, 2-MW-9, OS-MW-1, and OS-MW-2 be reduced from semiannually to annually during winter quarters. The key SVOC naphthalene has not been detected in groundwater from these wells for more than four consecutive quarters (Table 6 and Figure 3B). Winter quarters were chosen because naphthalene concentrations in groundwater from well 2-MW-8 were often higher during winter quarters than during other quarters.
3. Tetra Tech and the Air Force recommend that annual VOC sampling at wells 2-MW-3, 2-MW-7, 2-MW-9, and OS-MW-2 and annual TPHg sampling at wells 2-MW-7, 2-MW-8, 2-MW-9, and OS-MW-1 be changed from summer to winter since an evaluation of VOC concentrations from well 2-MW-8 indicates many of the higher concentrations were detected during winter quarters (Table 6).

These recommendations were developed in accordance with the Air Force Center for Environmental Excellence Long-Term Monitoring Optimization Guide (U.S. Air Force 1997) and the decision tree developed by Tetra Tech for the BGMP at Vandenberg AFB (Tetra Tech 2002). Using the decision tree, COC concentrations were evaluated for all Site 2 wells.

The fall 2005 sampling will be conducted according to the work plan (U.S. Air Force 2000a).

## 7.0 REFERENCES

California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC)

1999 *Preliminary Endangerment Assessment Guidance Manual.*

HydroGeoLogic, Inc. (HGL)

2001 *Supplemental Remedial Investigation Report, Site 2-Old Base Service Station, Vandenberg AFB, California. Final.* Prepared for the Air Force Center for Environmental Excellence. December.

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U.S. Air Force

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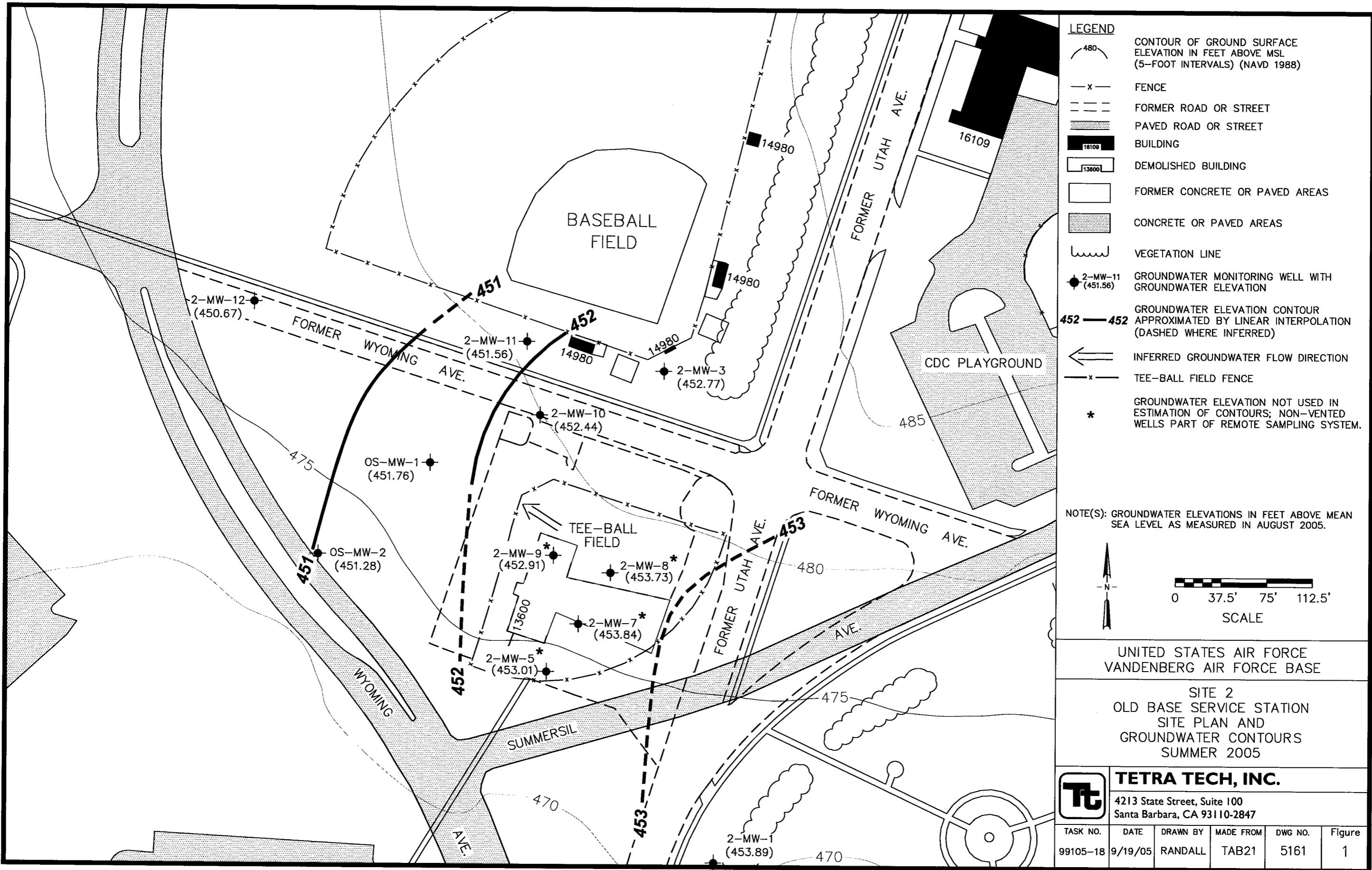
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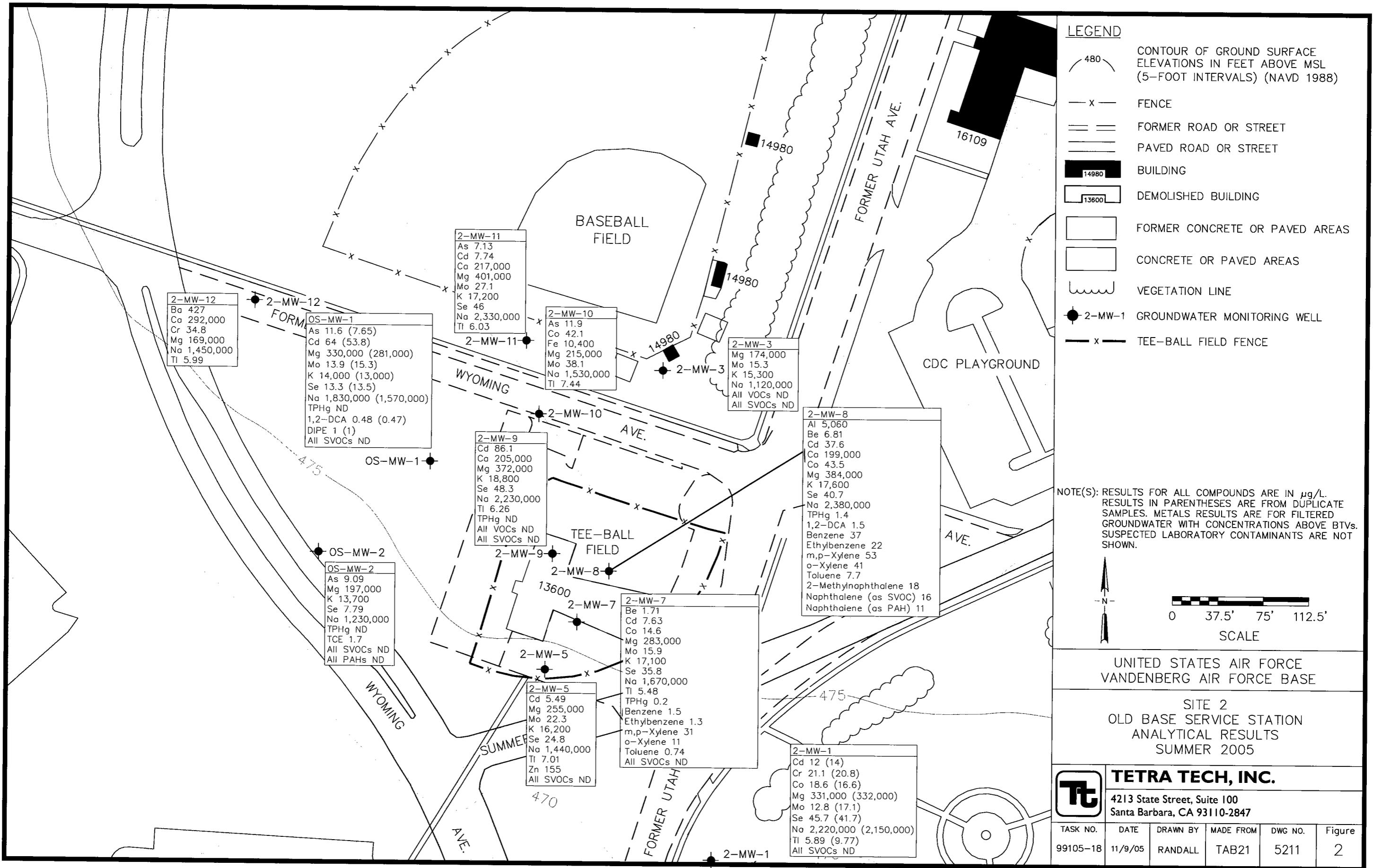
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2005 Integrated Risk Information System (IRIS). On-line database available at:  
<http://www.epa.gov/iris/>.





	2-MW-10	Benzene	Toluene	Naphthalene	Al	Be	Cd	Se	Tl
Dec-99	0.0472	ND	0.137	NA	NA	60.2	NA	NA	
Fall-00	ND	ND	ND	ND	ND	80.4	25.3	ND	
Win-01	ND	ND	ND	ND	ND	78.8	14.3	ND	
Spr-01	ND	0.53	ND	ND	ND	76.3	20.9	ND	
Sum-01	ND	ND	ND	232	ND	77.4	32.3	ND	
Fall-01	ND	ND	ND	277	ND	88.1	27.4	71.1	
Win-02*	ND	ND	ND	651	ND	71.8	22.6	ND	
Sum-02	ND	ND	NA	341	ND	87.5	9.67	ND	
Win-03	ND	ND	NA	622	ND	11.3	20.8	ND	
Sum-03	ND	ND	NA	939	2.7	59.7	23.9	ND	

	2-MW-12	Cd	Al	Se	Se	Tl
Spr-01	36.3	ND	ND	ND	ND	ND
Sum-01	36.1	ND	ND	ND	ND	ND
Fall-01	31.6	ND	ND	66.1	69.7	
Win-02*	ND	284	ND	ND	ND	
Spr-02	12.7	186	ND	ND	ND	
Sum-02	17.4	ND	ND	ND	ND	
Fall-02	ND	ND	40.7	ND	ND	
Win-03	8.12	ND	52.1	ND	ND	
Spr-03	1.9	26.6	ND	ND	ND	
Fall-03	ND	33.6	3.3	ND	ND	

	2-MW-11	Cd	Al	Se	Tl
Spr-01	36.3	ND	25.3	ND	
Sum-01	5.39	ND	24.1	ND	
Fall-01	7.18	ND	25.2	66.1	
Win-02*	4.33	341	25.8	ND	
Spr-02	5.11	242	55	ND	
Sum-02	5.8	ND	23.7	ND	
Fall-02	4.56	ND	87.5	ND	
Win-03	5.74	ND	148	ND	
Spr-03	5	33.2	36.3	ND	
Fall-03	6.5	26.2	36.3	ND	

	2-MW-3	Benzene	Al	Cd	Se	Tl
Dec-99	0.0465	NA	2.32	NA	NA	
Fall-00	ND	ND	12	ND	ND	
Win-01	ND	ND	ND	ND	ND	
Spr-01	ND	ND	4.13	ND	ND	
Sum-01	ND	ND	6.6	ND	ND	
Fall-01	ND	ND	2.05	ND	44.9	
Win-02*	ND	ND	5.84	ND	ND	
Spr-02	ND	118	7	ND	ND	
Sum-02	ND	ND	5.98	ND	ND	
Win-03	ND	ND	4.17	23.1	ND	
Sum-03	ND	ND	ND	ND	ND	

	OS-MW-1	Al	Cd	Se	Tl
Dec-99	NA	38.1	NA	NA	
Fall-00	ND	85.6	14.8	ND	
Win-01	ND	54.7	9.11	ND	
Spr-01	ND	54.5	16.3	ND	
Sum-01	ND	50.8	15.8	ND	
Fall-01	ND	60.5	13.6	65.2	
Win-02*	313	46.6	ND	ND	
Spr-02	NA	NA	NA	NA	
Sum-02	ND	58.8	ND	ND	
Fall-02	NA	NA	NA	NA	
Win-03	ND	63.2	58.3	ND	
Spr-03	NA	NA	NA	NA	
Sum-03	42.8	64.7	18	ND	
Fall-03	NA	NA	NA	NA	

	2-MW-9	Benzene	Toluene	Naphthalene	Al	Cd	Se	Tl
Dec-99	0.0485	ND	0.205	NA	42.3	NA	NA	
Fall-00	ND	ND	ND	ND	34	43.4	ND	
Win-01	ND	ND	ND	ND	74.5	37.5	ND	
Spr-01	ND	0.59	ND	268	76.5	40.3	ND	
Sum-01	ND	ND	ND	ND	81.1	42.0	ND	
Fall-01	ND	ND	ND	483	96	47.8	78.4	
Win-02*	ND	ND	ND	548	72.1	31.1	ND	
Sum-02	ND	ND	ND	ND	73.4	31.2	ND	
Win-03	ND	ND	ND	265	12.4	88.6	ND	
Sum-03	ND	ND	ND	284	85.8	56.7	ND	

	OS-MW-2	Cd	Al	Se	Tl
Spr-01	6.82	ND	10.7	ND	
Sum-01	13.9	ND	13.6	ND	
Fall-01	2.56	ND	38.5	ND	
Win-02*	10.9	211	ND	ND	
Sum-02	10.3	ND	ND	ND	
Win-03	10.4	ND	34.4	ND	
Sum-03	9.8	20.1	12.3	ND	

	2-MW-8	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylene	TPHg	Al	Be	Cd	Se	Tl
Dec-99	0.375	2.06	1.38	6.26	2.21	1.9	1.07	NA	NA	22.40	NA	NA
Fall-00	3.5	5.3	5.2	29	6.0	0.69	ND	1,380	ND	6.74	37.7	ND
Win-01	4.40	11	10	42	14	0.62	ND	1,260	ND	35.2	36.3	ND
Sum-01	5.1	11	8.7	37	12	0.88	5.3	1,650	ND	34	37.5	ND
Fall-01	5.3	6.4	4.9	37	10	0.64	ND	1,970	ND	38.7	43.2	76.9
Win-02*	36	64	62	250	74	4.9	21	13,500	12.7	35	ND	ND
Spr-02	7.7	12	12	61	21	1.2	10	12,700	13.1	37	35.2	ND
Sum-02	23	35	37	160	53	2.8	18	12,300	12.2	34.8	ND	ND
Fall-02	18	23	31	72	35	2.3	12	3,970	7.02	26.4	21.3	14.8
Win-03	26	37	36	180	52	3.6	16	7,410	11.3	38.9	88	ND
Spr-03	32.5	22.7	34.									

## LEGEND

480	CONTOUR OF GROUND SURFACE ELEVATION IN FEET ABOVE MSL (5-FOOT INTERVALS) (NAVD 1988)
— X —	FENCE
— — —	FORMER ROAD OR STREET
— . . . —	PAVED ROAD OR STREET
■ 14980	BUILDING
■ 13500	DEMOLISHED BUILDING
□	FORMER CONCRETE OR PAVED AREAS
▨	CONCRETE OR PAVED AREAS
~~~~~	VEGETATION LINE
● 2-MW-1	GROUNDWATER MONITORING WELL
— X —	TEE-BALL FIELD FENCE
NA	NOT ANALYZED
ND	NOT DETECTED; RESULT IS LESS THAN THE METHOD DETECTION LIMIT.
▫	RESULT WAS QUALIFIED FOR BLANK CONTAMINATION (B-QUALIFIED) AND IS SUSPECTED TO BE A FALSE POSITIVE.

NOTE(S): RESULTS FOR ALL COMPOUNDS EXCEPT TPHg ARE IN  $\mu\text{g}/\text{L}$ . TPHg RESULTS ARE IN  $\text{mg}/\text{L}$ . METALS RESULTS ARE FOR FILTERED GROUNDWATER. BTVs ARE AS FOLLOWS:  
 Al-1,200 $\mu\text{g}/\text{L}$   
 Be-0.3 $\mu\text{g}/\text{L}$   
 Cd-5 $\mu\text{g}/\text{L}$   
 Se-3 $\mu\text{g}/\text{L}$   
 Ti-1 $\mu\text{g}/\text{L}$

0 37.5' 75' 112.5'  
SCALE

UNITED STATES AIR FORCE  
VANDENBERG AIR FORCE BASE

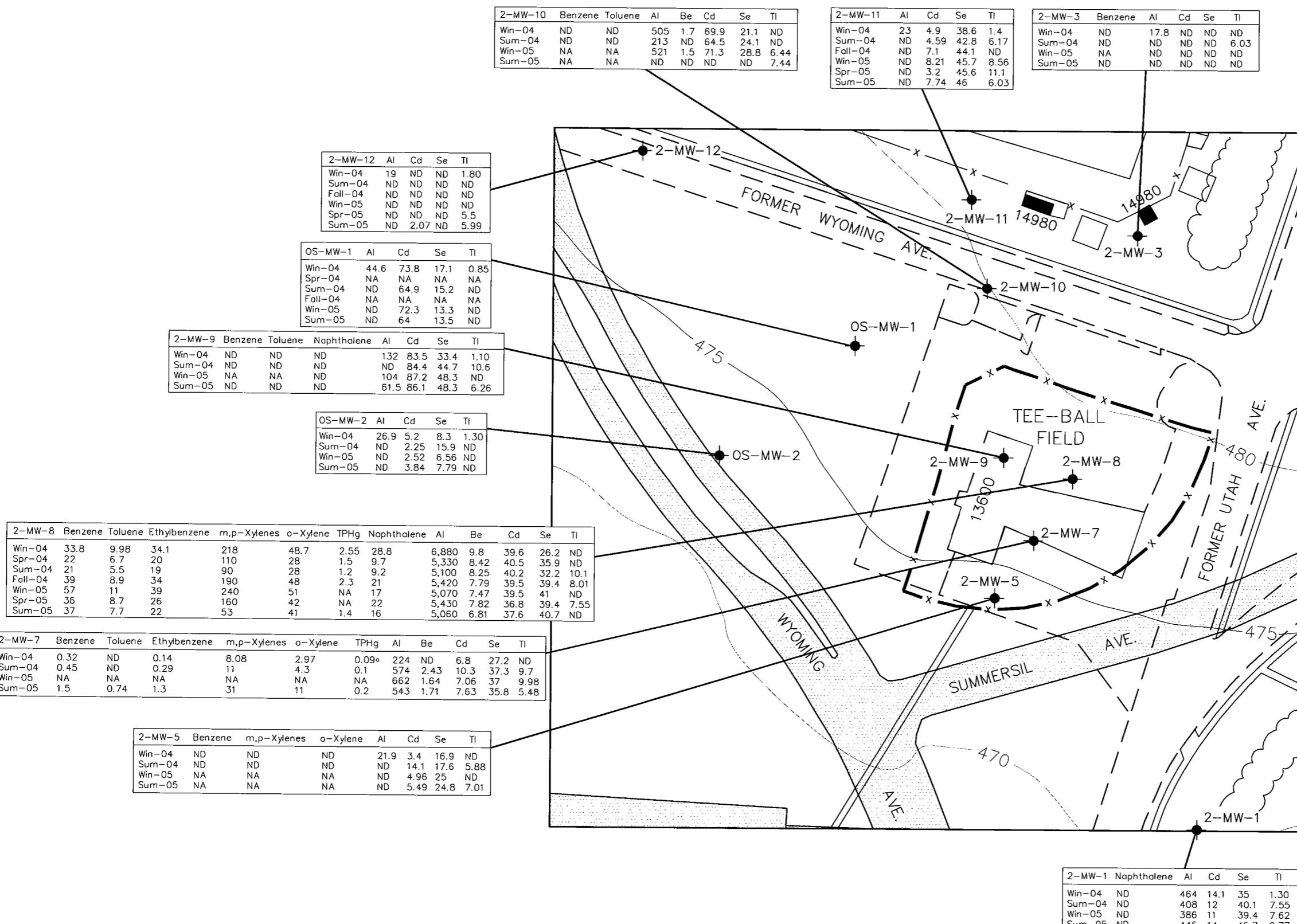
SITE 2  
OLD BASE SERVICE STATION  
HISTORICAL ANALYTICAL RESULTS OF  
BGMP KEY CONTAMINANTS OF CONCERN  
WINTER 2004 THROUGH SUMMER 2005



TETRA TECH, INC.

4213 State Street, Suite 100  
Santa Barbara, CA 93110-2847

TASK NO.	DATE	DRAWN BY	MADE FROM	DWG NO.	Figure
99105-18	11/9/05	RANDALL	TAB21	5213	3B



**Table 1**  
**Groundwater Elevations**  
**IRP Site 2 (Old Base Service Station)**  
**Vandenberg AFB, California**

Monitoring Well	Top of Casing Elevation (feet above msl)	Date Measured	Groundwater		Groundwater Elevation (feet above msl)		
			Summer 2005	Summer 2005	Summer 2005	Spring 2005	Winter 2005
2-MW-1	468.26	03-Aug-05	14.37	453.89	453.69	452.91	452.54
2-MW-3	482.84	01-Aug-05	30.07	452.77	452.54	451.72	451.44
2-MW-5 <sup>a</sup>	474.50	02-Aug-05	21.49	453.01	453.10	451.73	451.95
2-MW-7 <sup>a</sup>	475.39	02-Aug-05	21.55	453.84	454.18	451.86	452.27
2-MW-8 <sup>a</sup>	476.51	02-Aug-05	22.78	453.73	451.54	452.61	452.65
2-MW-9 <sup>a</sup>	476.24	02-Aug-05	23.33	452.91	453.73	452.91	452.08
2-MW-10	479.94	01-Aug-05	27.50	452.44	452.40	451.55	451.37
2-MW-11	482.10	03-Aug-05	30.54	451.56	451.32	450.49	450.14
2-MW-12	477.77	03-Aug-05	27.10	450.67	450.39	449.37	449.40
OS-MW-1	476.28	01-Aug-05	24.52	451.76	451.49	450.63	450.29
OS-MW-2	471.50	03-Aug-05	20.22	451.28	451.04	450.25	449.92

**Definition(s):**

- msl      - mean sea level
- TOC      - top of well casing

**Note(s):**

- <sup>a</sup>      - Non-vented well; part of remote sampling system.

**Table 2**  
**Water Quality Parameters**  
**Summer 2005**  
**IRP Site 2 (Old Base Service Station)**  
**Vandenberg AFB, California**

Sampling Location	2-MW-1 V2MW1	2-MW-3 V2MW3	2-MW-5 V2MW5	2-MW-7 V2MW7	2-MW-8 V2MW8	2-MW-9 V2MW9
Sample ID						
Collection Date	03-Aug-05	01-Aug-05	02-Aug-05	02-Aug-05	02-Aug-05	02-Aug-05
<b>Field Parameters<sup>1</sup>:</b>						
Temperature (°Celsius)	15.90	19.96	21.66	22.96	22.02	23.31
Conductivity ( $\mu\text{mhos}/\text{cm}$ )	11,292	6,562	9,344	9,523	14,234	13,989
pH	5.42	6.19	5.95	6.29	4.65	5.80
Turbidity (NTUs)	44.7	0.59	3.77	2.26	0.29	4.65
Sampling Location	2-MW-10 V2MW10F	2-MW-11 V2MW11F	2-MW-12 V2MW12F	OS-MW-1 VOSMW1	OS-MW-2 VOSMW2M	OS-MW-2 VOSMW2M
Sample ID						
Collection Date	01-Aug-05	03-Aug-05	03-Aug-05	01-Aug-05	01-Aug-05	03-Aug-05
<b>Field Parameters<sup>1</sup>:</b>						
Temperature (°Celsius)	20.66	19.59	20.48	22.55	18.27	
Conductivity ( $\mu\text{mhos}/\text{cm}$ )	8,364	13,308	8,447	NM <sup>2</sup>	2,443	
pH	6.02	6.12	10.48	6.27	7.17	
Turbidity (NTUs)	67.2	2.24	19.6	75.3	1.87	

**Definition(s):**

- $\mu\text{mhos}/\text{cm}$  - micromhos per centimeter
- NM - not measured
- NTU - nephelometric turbidity unit

**Note(s):**

- <sup>1</sup> - field parameters measured immediately prior to sampling.
- <sup>2</sup> - not measured due to unreliable readings during purging

Table 3  
Metals in Groundwater  
Summer 2005  
EPA Methods SW6010B and SW7470A ( $\mu\text{g/L}$ )  
IRP Site 2 (Old Base Service Station)  
Vandenberg AFB, California

Sample Location	Sample ID	Collection Date	Primary	2-MW-1	2-MW-1	2-MW-3	2-MW-5	2-MW-7	2-MW-8	2-MW-9
Dissolved Metals	MDL <sup>1</sup>	PQL <sup>1</sup>	MCL	V2MW1F 03-Aug-05	V99W547F (D) 03-Aug-05	V2MW3F 01-Aug-05	V2MW5F 02-Aug-05	V2MW7F 02-Aug-05	V2MW8F 02-Aug-05	V2MW9F 02-Aug-05
Aluminum	1.5	60	1,000	1,200	438	g	445	g	60 U g	543 g
Antimony <sup>2</sup>	40	100	6	10	40	U g	40	U g	40 U g	40 U g
Arsenic	4	10	50	7	5	U g	6.86	J q	6.8 U g	5 U g
Barium	1	5	1,000	276	33	g	33	g	104 g	203 g
Beryllium <sup>2</sup>	1	5	4	0.3	1	U g	1	U g	1 U g	143 g
Cadmium	1	5	5	5	12	g	12	g	2 U g	171 J q
Calcium	22	500	N/A	197,000	167,000	g	168,000	g	129,000 g	5.49 g
Chromium	1	10	50	20	21.1	g	20.8	g	168,000 g	162,000 g
Cobalt	2	15	N/A	13	18.6	g	16.6	g	7.81 J q	7.81 J q
Copper	1	10	1,300	58	5	U g	8.8	J q	5 U g	14.8 J q
Iron	4	100	N/A	3,530	53.5	J q	51.5	J q	5 U g	6.5 J q
Lead	2	3	15	3	2	U g	2	U g	1,350 g	59.1 J q
Magnesium	26	200	N/A	119,000	331,000	g	332,000	g	174,000 g	2 U g
Manganese	1	5	N/A	971	223	g	219	g	418 g	2 U g
Mercury	0.09	0.3	2	0.2	0.45	J q	0.194	J q	0.1 U g	283,000 g
Molybdenum	2	15	N/A	12	12.8	J q	17.1	g	17.1 U g	255,000 g
Nickel	5	20	100	490	215	g	220	g	228 g	107 g
Potassium	41	1,000	N/A	13,300	12,400	g	11,300	g	153,000 g	16,200 g
Selenium <sup>2</sup>	5	10	50	3	45.7	g	41.7	g	16 g	17,100 g
Silver <sup>2</sup>	1	10	N/A	0.2	5	U g	5	U g	5 U g	17,600 g
Sodium	23	500	N/A	420,000	2,220,000	g	2,150,900	g	1,120,000 g	1,440,000 g
Thallium <sup>2</sup>	5	10	2	1	5.89	J q	9.77	J q	7.01 J q	5.48 J q
Vanadium	1	10	N/A	28	5	U g	5.6	J q	5 U g	5 U g
Zinc	2	20	N/A	80	16.8	B J a,q	11.1	B J a,q	10.5 J q	153 g

Table 3  
Metals in Groundwater  
Summer 2005  
EPA Methods SW6010B and SW7470A (µg/L)  
IRP Site 2 (Old Base Service Station)  
Vandenberg AFB, California

Sample Location		2-MW-10 V2MW10F 01-Aug-05	2-MW-11 V2MW11F 03-Aug-05	2-MW-12 V2MW12F 03-Aug-05	OS-MW-1 V99W539F(D) 01-Aug-05	OS-MW-1 V99W539F(D) 01-Aug-05	OS-MW-2 VOSMW2F 03-Aug-05
Dissolved Metals	MDL <sup>1</sup>	PQL <sup>1</sup>	MCL	BTW			
Aluminum	1.5	60	1,000	1,200	60 U g	60 U g	60 U g
Antimony <sup>2</sup>	40	100	6	10	40 U g	40 U g	40 U g
Arsenic	4	10	50	7	11.9 g	7.13 J q	6.45 J q
Barium	1	5	1,000	276	73.4 g	91 g	427 g
Beryllium <sup>2</sup>	1	5	4	0.3	1 U g	1 U g	1 U g
Cadmium	1	5	5	5	2 U g	7.74 g	2.07 J q
Calcium	22	500	N/A	197,000	103,000 g	217,000 g	292,000 g
Chromium	1	10	50	20	5 U g	5 U g	34.8 g
Cobalt	2	15	N/A	13	42.4 g	5 U g	5 U g
Copper	1	10	1,300	58	5 U g	5 U g	5 U g
Iron	4	100	N/A	3,530	10,400 g	40 U g	40 U g
Lead	2	3	15	3	2 U g	2 U g	2 U g
Magnesium	26	200	N/A	119,000	215,000 g	401,000 g	169,000 g
Manganese	1	5	N/A	971	951 g	36 g	9.09 g
Mercury	0.09	0.3	2	0.2	0.1 U g	0.1 U g	0.1 U g
Molybdenum	2	15	N/A	12	38.1 g	27.1 g	11.4 J q
Nickel	5	20	100	490	47.8 g	93.5 g	17.5 J q
Potassium	41	1,000	N/A	13,300	11,800 g	117,200 g	11,200 g
Selenium <sup>2</sup>	5	10	50	3	5 U g	46 g	14,000 g
Silver <sup>2</sup>	1	10	N/A	0.2	5 U g	5 U g	5 U g
Sodium	23	500	N/A	420,000	1,530,000 g	2,330,000 g	1,830,000 g
Thallium <sup>2</sup>	5	10	2	1	7.54 J q	6.03 J q	5.99 J q
Vanadium	1	10	N/A	28	5 U g	5 U g	5 U g
Zinc	2	20	N/A	80	5 U g	14.7 BJ a,q	46.9 g

**Table 3**  
**Metals in Groundwater**  
**Summer 2005**  
**EPA Methods SW6010B and SW7470A (µg/L)**  
**IRP Site 2 (Old Base Service Station)**  
**Vandenberg AFB, California<sup>a</sup>**

<b>Data Validity Qualifier(s):</b>	
B	<ul style="list-style-type: none"> <li>- The sample result is less than 5 times (10 times for common organic laboratory contaminants) the blank contamination. The result is considered not to have originated from the environmental sample, because cross-contamination is suspected.</li> </ul>
J	<ul style="list-style-type: none"> <li>- The analyte was positively identified and the result is usable; however, the analyte concentration is an estimated value.</li> </ul>
U	<ul style="list-style-type: none"> <li>- The analyte was not detected at or above the MDL.</li> </ul>
<b>Data Validity Comment(s):</b>	
a	<ul style="list-style-type: none"> <li>- The analyte was found in the method blank.</li> </ul>
g	<ul style="list-style-type: none"> <li>- The data met prescribed criteria as detailed in the QAPP.</li> </ul>
q	<ul style="list-style-type: none"> <li>- The analyte detection was below the PQL.</li> </ul>
<b>Definition(s):</b>	
BTV	- background threshold value
MCL	- maximum contaminant level
MDL	- method detection limit
µg/L	- micrograms per liter
N/A	- not applicable
PQL	- practical quantitation limit
QAPP	- Quality Assurance Project Plan
<b>Note(s):</b>	
Bold type indicates results that were above the MCL.	
Shading indicates results that were above the 95th percentile BTV.	
1      - Values from QAPP Addendum (U.S. Air Force 2004a).	
2      - The BTV was less than the detection limit for this metal.	

Table 4  
TPH as Gasoline, SVOCs, and PAHs in Groundwater  
Summer 2005  
EPA Methods SW8015B, SW8270C, and SW8270C SIM  
IRP Site 2 (Old Base Service Station)  
Vandenberg AFB, California

Sample Location	Sample ID	Collection Date	TPH as gasoline (mg/L)	SVOCs (µg/L)			All Other Target Analytes	Naphthalene	PAHs (µg/L)
				bis(2-Ethyhexyl) phthalate	2-Methylnaphthalene	Naphthalene			
2-MW-1	V2MW1	03-Aug-05	MDL <sup>1</sup>	0.02	2.3	1.8	1.6	N/A	0.024
2-MW-1	V99W547 (D)	03-Aug-05	PQL <sup>1</sup>	0.1	10	10	N/A	N/A	N/A
2-MW-3	V2MW3	01-Aug-05		NA	4.8 U g	4.8 U g	4.8 U g	ND	ND
2-MW-5	V2MW5	02-Aug-05		NA	5 U g	5 U g	5 U g	ND	ND
2-MW-7	V2MW7	02-Aug-05		0.2	14	14	4.8 U g	ND	ND
2-MW-8	V2MW8	02-Aug-05		0.2	NA	4.9 U g	4.9 U g	ND	ND
2-MW-9	V2MW9	02-Aug-05		1.4	4.9	4.9 U g	4.9 U g	ND	ND
OS-MW-1	VOSMW1	01-Aug-05		0.02	U g	4.9 U g	4.9 U g	ND	ND
OS-MW-1	V99W539 (D)	01-Aug-05		0.02	U g	4.9 U g	4.9 U g	ND	ND
OS-MW-2	VOSMW2M	03-Aug-05		0.02	U g	4.8 U g	4.8 U g	ND	ND

Data Validity Qualifier(s):

U - The analyte was not detected at or above the MDL.

Data Validity Comment(s):

g - The data met prescribed criteria as detailed in the QAPP.

Definition(s):

- (D) - duplicate sample
- MDL - method detection limit
- µg/L - micrograms per liter
- mg/L - milligrams per liter
- N/A - not applicable
- NA - not analyzed
- ND - not detected; result is less than the MCL
- PAH - polynuclear aromatic hydrocarbon
- PQL - practical quantitation limit
- QAPP - Quality Assurance Project Plan
- SIM - selected ion monitoring
- SVOC - semivolatile organic compound
- TPH - total petroleum hydrocarbons

Note(s):

- <sup>1</sup> - Values from QAPP Addendum (U.S. Air Force 2004a).

Table 5  
VOCs in Groundwater  
Summer 2005  
EPA Method SW8460B ( $\mu\text{g/L}$ )  
IRP Site 2 (Old Base Service Station)  
Vandenberg AFB, California

Sample Location	2-MW-3	2-MW-7	2-MW-8	2-MW-9	OS-MW-1	OS-MW-1
Sample ID	V2MW3	V2MW7	V2MW8	V2MW9	V99W539 (D)	V99W539 (D)
Collection Date	01-Aug-05	02-Aug-05	02-Aug-05	02-Aug-05	01-Aug-05	01-Aug-05
MDL <sup>1</sup>	PQL <sup>1</sup>	Primary MCL				
1,2-DCA	0.06	1.0	0.5	0.2 U g	0.2 U g	0.48 J q
Benzene	0.07	0.4	1	0.2 U g	0.2 U g	0.2 U g
DIPE	0.16	5.0	N/A	0.2 U g	0.2 U g	0.2 U g
Ethylbenzene	0.12	1.0	300	0.2 U g	0.2 U g	0.2 U g
m,p-Xylene	0.25	2.0	1,750 <sup>2</sup>	0.5 U g	31 g	53 J b
o-Xylene	0.13	1.0	1,750 <sup>2</sup>	0.2 U g	11 g	41 J b
Toluene	0.11	1.0	150	0.2 U g	0.74 J q	7.7 J b
TCE	0.18	1.0	5	0.2 U g	0.2 U g	0.2 U g
All other target analytes	N/A	N/A	N/A	ND	ND	ND

Data Validity Qualifier(s):

- J - The analyte was positively identified and the result is usable; however, the analyte concentration is an estimated value.
- U - The analyte was not detected at or above the MDL.

Data Validity Comment(s):

- b - The surrogate spike recovery was outside quality control criteria.
- g - The data met prescribed criteria as detailed in the QAPP.
- q - The analyte detection was below the PQL.

Definition(s):

- (D) - duplicate sample
- DCA - dichloroethane
- DIPE - diisopropyl ether
- MCL - maximum contaminant level
- MDL - method detection limit
- $\mu\text{g/L}$  - micrograms per liter
- N/A - not applicable
- ND - not detected; result is less than the MDL
- PQL - practical quantitation limit
- QAPP - Quality Assurance Project Plan
- TCE - trichloroethene

Note(s):

- 1 - Bold type indicates results that were above the MCL.
- 2 - Values from QAPP Addendum (U.S. Air Force 2004a).
- 2 - MCL of 1,750  $\mu\text{g/L}$  applies to sum of m-xylene, o-xylene, and p-xylene.

Table 6  
Summary of BGMP Key Contaminants of Concern  
IRP Site 2 (Old Base Service Station)  
Vandenberg AFB, California

	Benzene ( $\mu\text{g/L}$ ) <sup>a</sup>																					
	Dec-99	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02 <sup>b</sup>	Spr-02	Sum-02	Fall-02	Win-03	Spr-03	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05	
2-MW-1	ND	ND	ND	ND	ND	NA	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
2-MW-3	0.0465	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	NA	NA	NA	ND	NA	NA	
2-MW-5	0.0675	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA	
2-MW-6	0.0445	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
2-MW-7	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	0.69	NA	ND	0.23	NA	0.32	NA	0.45	NA	NA	1.5
2-MW-8	0.375	3.5	4.4	NA	5.1	5.3	36	7.7	23	18	26	32.5	22.5	33	33.8	22	21	39	57	36	37	
2-MW-9	0.0485	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	NA	NA	NA	NA	NA	ND	
2-MW-10	0.0472	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	NA	NA	
2-MW-11	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	NA	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	
2-MW-12	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	NA	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	
OS-MW-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
OS-MW-2	NA	NA	NA	NA	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	NA	ND	

	Toluene ( $\mu\text{g/L}$ ) <sup>a</sup>																				
	Dec-99	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02 <sup>b</sup>	Spr-02	Sum-02	Fall-02	Win-03	Spr-03	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05
2-MW-1	ND	ND	ND	ND	ND	NA	NA	NA	NA	ND	NA	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA
2-MW-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	NA	NA	ND
2-MW-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	0.44	NA	ND	NA	ND	NA	NA	NA	NA
2-MW-6	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	ND	ND	ND	ND	ND	ND	NA	ND	NA	2.2	NA	1.2	NA	0.17	NA	ND	NA	ND	NA	NA	0.74
2-MW-8	2.06	5.3	11	NA	11	6.4	64	12	35	23	37	22.7	12.1	24.1	9.98	6.7	5.5	8.9	1.1	8.7	7.7
2-MW-9	ND	ND	ND	ND	0.59	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	NA	ND
2-MW-10	ND	ND	ND	ND	0.53	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	NA	NA
2-MW-11	NA	NA	NA	NA	ND	ND	ND	ND	NA	ND	NA	NA	ND	NA	ND	NA	ND	NA	NA	NA	NA
2-MW-12	NA	NA	NA	NA	ND	ND	ND	ND	NA	ND	NA	NA	ND	NA	ND	NA	ND	ND	NA	NA	ND
OS-MW-1	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	0.4	ND	ND	ND	ND	ND	ND	ND	ND	ND
OS-MW-2	NA	NA	NA	NA	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	NA	ND

Table 6  
Summary of BGMP Key Contaminants of Concern  
IRP Site 2 (Old Base Service Station)  
Vandenberg AFB, California

	Dec-99	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02 <sup>i</sup>	Spr-02	Sum-02	Fall-02	Win-03	Spr-03	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05	Ethybenzene (µg/L) <sup>a</sup>
2-MW-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
2-MW-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
2-MW-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
2-MW-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
2-MW-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
2-MW-8	1.38	5.2	10	NA	8.7	4.9	62	12	37	31	36	34.7	32.3	26.9	34.1	20	19	34	39	26	22	1.3
2-MW-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-MW-10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-MW-11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OS-MW-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND

	Dec-99	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02 <sup>i</sup>	Spr-02	Sum-02	Fall-02	Win-03	Spr-03	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05	Ethybenzene (µg/L) <sup>a</sup>
																						NA
2-MW-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
2-MW-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
2-MW-5	0.316	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
2-MW-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
2-MW-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
2-MW-8	4.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	31
2-MW-9	6.26	29	42	NA	37	250	61	160	72	180	230	125	227	218	110	90	190	240	160	53	ND	NA
2-MW-10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
2-MW-11	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
2-MW-12	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
OS-MW-2	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA

Table 6  
Summary of BCMP Key Contaminants of Concern  
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	o-Xylene ( $\mu\text{g/L}$ ) <sup>b</sup>																				
	Dec-99	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02 <sup>i</sup>	Spr-02	Sum-02	Fall-02	Win-03	Spr-03	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05
2-MW-1	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-MW-5	0.114	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-MW-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-MW-7	ND	ND	ND	ND	ND	ND	ND	4.9	NA	8.6	NA	6.4	NA	2.59	NA	2.97	NA	4.3	NA	NA	11
2-MW-8	2.21	6	14	NA	12	10	74	21	53	35	52	56.2	24.7	61.6	48.7	28	48	51	42	41	
2-MW-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-MW-10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-MW-11	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	NA	NA	NA	ND	NA	ND	NA	NA	NA	NA	NA
2-MW-12	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	NA	NA	NA	ND	NA	ND	NA	NA	NA	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OS-MW-2	NA	NA	NA	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	ND

	TPH as gasoline (mg/L)																				
	Dec-99	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02 <sup>i</sup>	Spr-02	Sum-02	Fall-02	Win-03	Spr-03	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05
2-MW-1	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-3	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-5	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-6	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	ND	ND	ND	ND	ND	ND	0.27	NA	0.25	NA	0.15	NA	0.09	NA	0.09 <sup>c</sup>	NA	0.1	NA	NA	NA	0.2
2-MW-8	0.0719	0.69	0.62	NA	0.88	0.64	4.9	1.2	2.8	2.3	3.6	2.72	2.27	2.5	1.5	1.2	2.3	NA	NA	1.4	
2-MW-9	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	0.02 <sup>c</sup>	NA	ND	NA	NA	ND
2-MW-10	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-11	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-12	NA	NA	NA	NA	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	0.02 <sup>c</sup>	NA	ND	NA	NA	ND
OS-MW-2	NA	NA	NA	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	0.03 <sup>c</sup>	NA	ND	NA	ND	ND

Table 6  
Summary of BGMP Key Contaminants of Concern  
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	Naphthalene ( $\mu\text{g/L}$ )																				
	Dec-99	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02 <sup>i</sup>	Spr-02	Sum-02	Fall-02	Win-03	Spr-03	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05
2-MW-1	0.124	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
2-MW-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
2-MW-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
2-MW-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
2-MW-8	1.07	ND	ND	NA	5.3	ND	21	10	18	12	16	15.2	18.5	25.7	28.8	9.7	9.2	21	17	22	16
2-MW-9	0.205	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
2-MW-10	0.137	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-11	NA	NA	NA	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-12	NA	NA	NA	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
OS-MW-2	NA	NA	NA	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND

	Dissolved Aluminum ( $\mu\text{g/L}$ ) <sup>d</sup>																				
	Dec-99	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02 <sup>i</sup>	Spr-02	Sum-02	Fall-02	Win-03	Spr-03	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05
2-MW-1	NA	238	380	293	ND	464	662	NA	288	NA	ND	NA	383	NA	464	NA	408	NA	386	NA	445
2-MW-3	NA	ND	ND	ND	ND	ND	118	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	ND
2-MW-5	NA	ND	ND	ND	ND	ND	209	NA	ND	NA	ND	NA	ND	NA	21.9	NA	ND	NA	ND	NA	ND
2-MW-6	NA	399	ND	ND	ND	ND	229	678	NA	374	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	NA	470	373	423	408	666	1,180	NA	200	NA	475	NA	519	NA	224	NA	574	NA	662	NA	543
2-MW-8	NA	1,380	1,260	NA	NA	1,650	1,350	1,2700	1,2300	3,970	7,410	8,600	8,320	9,300	6,880	5,300	5,100	5,420	5,070	5,430	5,060
2-MW-9	NA	ND	ND	268	ND	483	548	NA	ND	265	NA	284	NA	132	NA	ND	NA	104	NA	61.5	
2-MW-10	NA	ND	ND	232	277	651	NA	341	NA	622	NA	939	NA	505	NA	213	NA	521	NA	ND	
2-MW-11	NA	NA	NA	ND	ND	341	242	ND	ND	33.2 <sup>c</sup>	NA	26.2	23	NA	ND	ND	ND	ND	ND	ND	
2-MW-12	NA	NA	NA	ND	ND	284	186	ND	ND	26.6 <sup>c</sup>	NA	33.6	19	NA	ND	ND	ND	ND	ND	ND	
OS-MW-1	NA	ND	ND	ND	ND	ND	313	NA	ND	NA	ND	NA	42.8	NA	44.6	NA	ND	NA	ND	NA	ND
OS-MW-2	NA	NA	NA	ND	ND	ND	211	NA	ND	NA	ND	NA	20.1	NA	26.9	NA	ND	NA	ND	NA	ND

Table 6  
Summary of BGMP Key Contaminants of Concern  
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	Dissolved Beryllium ( $\mu\text{g/L}$ ) <sup>e</sup>																				
	Dec-99	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02 <sup>i</sup>	Spr-02	Sum-02	Fall-02	Win-03	Spr-03	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05
2-MW-1	NA	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	ND
2-MW-3	NA	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	ND
2-MW-5	NA	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	ND
2-MW-6	NA	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-7	NA	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	ND
2-MW-8	NA	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	ND
2-MW-9	NA	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	ND
2-MW-10	NA	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	ND
2-MW-11	NA	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	ND
2-MW-12	NA	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	ND
OS-MW-1	NA	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	ND
OS-MW-2	NA	NA	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	ND

	Dissolved Cadmium ( $\mu\text{g/L}$ ) <sup>f</sup>																				
	Dec-99	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02 <sup>i</sup>	Spr-02	Sum-02	Fall-02	Win-03	Spr-03	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05
2-MW-1	10.8	554	12.4	12.7	10.2	12.4	11.1	NA	107	NA	79.6	NA	13.1	NA	14.1	NA	12	NA	11	NA	14
2-MW-3	2.32	12	ND	4.13	6.6	2.05	5.84	7	5.98	NA	4.17	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
2-MW-5	ND	4.9	298	141	59.3	137	4.74	NA	13.6	NA	6.68	NA	4.5	NA	3.4	NA	14.1	NA	4.96	NA	5.49
2-MW-6	4.31	ND	41	20.5	8.96	30.2	5.22	NA	4.66	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	2.79	4.4	6.39	6.62	6.78	29.7	17.5	NA	1.94	NA	8.63	NA	7.6	NA	6.8	NA	10.3	NA	7.06	NA	7.63
2-MW-8	22.4	6.74	35.2	NA	34	38.7	35	37	34.8	26.4	38.9	41.6	39.6	40.5	40.2	39.5	39.5	39.5	39.5	39.5	37.6
2-MW-9	42.3	34	74.5	76.5	81.1	96	72.1	NA	73.4	NA	12.4	NA	85.8	NA	83.5	NA	84.4	NA	87.2	NA	86.1
2-MW-10	60.2	80.4	78.8	76.3	77.4	88.1	71.8	NA	87.5	NA	11.3	NA	59.7	NA	69.9	NA	64.5	NA	71.3	NA	ND
2-MW-11	NA	NA	NA	5.87	5.39	7.18	4.33	5.11	5.8	4.56	5.74	5	NA	6.5	4.9	NA	4.59	7.1	8.21	3.2	7.74
2-MW-12	NA	NA	NA	36.3	36.1	31.6	ND	12.7	17.4	ND	8.12	1.9	NA	ND	ND	NA	ND	ND	ND	ND	2.07
OS-MW-1	38.1	85.6	54.7	51.5	50.8	60.5	46.6	NA	58.8	NA	63.2	NA	64.7	NA	73.8	NA	64.9	NA	72.3	NA	64
OS-MW-2	NA	NA	6.82	13.9	2.56	10.9	NA	10.3	NA	10.4	NA	9.8	NA	5.2	NA	2.25	NA	2.52	NA	3.84	3.84

Table 6  
Summary of BGMP Key Contaminants of Concern  
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	Dec-99	Dissolved Selenium ( $\mu\text{g/L}$ ) <sup>a</sup>												Sum-04	Spr-04	Win-04	Fall-04	Spr-05	Win-05	Fall-04	Spr-05	Sum-05		
		Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02 <sup>i</sup>	Spr-02	Sum-02	Fall-02	Win-03	Spr-03	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Win-05	Fall-04	Spr-05	Sum-05
2-MW-1	NA	39.8	35.8	32.4	37.6	43.8	32	NA	23.9	NA	42.9	NA	40.1	NA	39.4	NA	39.4	NA	ND	ND	NA	45.7	NA	
2-MW-3	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA	23.1	NA	ND	NA	ND	NA	ND	NA	ND	ND	NA	ND	ND	
2-MW-5	NA	ND	14.9	7.08	10.7	ND	NA	ND	NA	NA	47.6	NA	62.6	NA	16.9	NA	17.6	NA	25	NA	NA	24.8	NA	
2-MW-6	NA	31.9	29.8	28.5	35.9	6.83	30.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
2-MW-7	NA	35.1	28.8	34.2	31.2	46.1	31.3	NA	22.3	NA	63.1	NA	57.5	NA	27.2	NA	37.3	NA	37	NA	NA	35.8	NA	
2-MW-8	NA	37.7	36.3	NA	37.5	43.2	ND	35.2	ND	21.3	88.0	26.7	43.1	30.7	26.2	35.9	32.2	39.4	41	39.4	40.7	NA	NA	
2-MW-9	NA	43.4	37.5	40.3	42.0	47.8	31.1	NA	31.2	NA	88.6	NA	56.7	NA	33.4	NA	44.7	NA	48.3	NA	NA	NA	NA	
2-MW-10	NA	23.5	14.3	20.9	32.3	27.4	22.6	NA	9.67	NA	20.8	NA	23.9	NA	21.1	NA	24.1	NA	28.8	NA	ND	NA	ND	
2-MW-11	NA	NA	25.3	24.1	25.2	25.8	55	23.7	87.5	14.8	36.3	NA	36.3	NA	38.6	NA	42.8	NA	44	NA	45.7	NA	46	
2-MW-12	NA	NA	NA	ND	ND	ND	ND	ND	40.7	52.1	ND	NA	3.3	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	
OS-MW-1	NA	14.8	9.11	16.3	15.8	13.6	ND	ND	NA	58.3	NA	18	NA	17.1	NA	15.2	NA	13.3	NA	ND	ND	ND	ND	
OS-MW-2	NA	NA	NA	10.7	13.6	ND	ND	NA	ND	34.4	NA	12.3	NA	8.3	NA	15.9	NA	6.56	NA	6.56	NA	7.79	NA	
Dissolved Thallium ( $\mu\text{g/L}$ ) <sup>b</sup>																								
	Dec-99	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02 <sup>i</sup>	Spr-02	Sum-02	Fall-02	Win-03	Spr-03	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Win-05	Fall-04	Spr-05	Sum-05
2-MW-1	NA	ND	ND	ND	66.6	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	7.55	NA	7.62	NA	9.77	NA	ND	
2-MW-3	NA	ND	ND	ND	44.9	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	6.03	NA	ND	NA	ND	NA	ND	
2-MW-5	NA	ND	ND	ND	90.0	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	5.88	NA	ND	NA	ND	NA	7.01	
2-MW-6	NA	ND	ND	ND	35.9	ND	ND	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
2-MW-7	NA	ND	ND	ND	59.9	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	9.7	NA	9.98	NA	NA	NA	5.48	
2-MW-8	NA	ND	ND	ND	76.9	ND	ND	NA	ND	NA	ND	NA	ND	ND	ND	ND	10.1	NA	8.01	ND	7.55	ND	ND	
2-MW-9	NA	ND	ND	ND	78.4	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	10.6	NA	ND	NA	ND	NA	6.26	
2-MW-10	NA	ND	ND	ND	71.1	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	11.0	NA	ND	NA	ND	NA	7.44	
2-MW-11	NA	ND	ND	ND	66.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14.0	NA	6.17	ND	ND	ND	6.03	
2-MW-12	NA	ND	ND	ND	69.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	18.0	NA	ND	ND	ND	ND	5.99	
OS-MW-1	NA	ND	ND	ND	65.2	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	0.85	NA	ND	NA	ND	NA	ND	
OS-MW-2	NA	NA	NA	ND	38.5	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	1.30	NA	ND	NA	ND	NA	ND	

**Table 6**  
**Summary of BGMP Key Contaminants of Concern**  
**IRP Site 2 (Old Base Service Station)**  
**Vandenberg AFB, California**

<b>Definition(s):</b>	
BTV	- background threshold value
MCL	- maximum contaminant level
$\mu\text{g/L}$	- micrograms per liter
mg/L	- milligrams per liter
NA	- not analyzed
ND	- not detected; result is less than the method detection limit
TPH	- total petroleum hydrocarbons

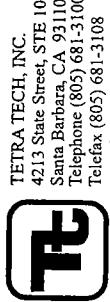
  

<b>Note(s):</b>	
B	Bold type indicates results that were above the MCL.
S	Shading indicates results that were above the 95th percentile BTV.
a	- The MCLs for benzene, toluene, and ethylbenzene are 1, 150, and 300 $\mu\text{g/L}$ , respectively.
b	- The MCL of 1,750 $\mu\text{g/L}$ applies to the sum of m-xylene, o-xylene, and p-xylene.
c	- The data were qualified for blank contamination during the validation process. The laboratory method blank showed the same order of magnitude as the sample results. The sample results are strongly suspected to be false positive.
d	- The BTV and MCL for aluminum are 1,200 and 1,000 $\mu\text{g/L}$ , respectively.
e	- The BTV and MCL for beryllium are 0.3 and 4 $\mu\text{g/L}$ , respectively.
f	- The BTV and MCL for cadmium are both 5 $\mu\text{g/L}$ .
g	- The BTV and MCL for selenium are 3 and 50 $\mu\text{g/L}$ , respectively.
h	- The BTV and MCL for thallium are 1 and 2 $\mu\text{g/L}$ , respectively.
i	- Dedicated MicroPurge pumps were installed in Site 2 wells during winter 2002.

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## **APPENDIX A**

## **PURGE RECORDS**



TETRA TECH, INC.  
4213 State Street, STE 100  
Santa Barbara, CA 93110  
Telephone (805) 681-3100  
Telefax (805) 681-3105

GROUNDWATER MONITORING WELL  
FIELD DATA LOG SHEET - PURGING

Page 1 of 1

DATE 8/31/05

PROGRAM NAME B6MP

SITE NUMBER 1

MONITORING WELL IDENTIFICATION 2-MW-1

DUPPLICATE I.D. VMMW547

STATIC WATER LEVEL (ft btoc) 14.37

TOTAL WELL DEPTH (ft btoc) 36.3

WATER COLUMN (feet) 21.9

TUBING DIAMETER (in) .68

PUMP & TUBING (V) (L) 3 V (L)

3 V (L) 2.04

PURGING DEVICE

MICROPURGE DEDICATED PUMP

SAMPLING DEVICE

MICROPURGE DEDICATED PUMP

PID READING IN CASING (ppm) 0.0

(initial) 0.0 (vented to) 0.0

PID READING IN BREATHING ZONE (ppm) 0.0

(initial) 0.0 (vented to) 0.0

SAMPLER'S SIGNATURE Mark M. Hink

Time	Activity	Water Level (ft btoc)	Temp (Deg. C)	EC (µmhos/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (L)	Pump Tubing Volumes Purged	Flow Rate (L/PM)
0632	Begin Purge	14.94	15.75	11227	5.48	52.6	1.78	96.4	Cloudy	0.75	1.10	0.25
0638		14.99	15.74	11244	5.44	59.4	1.30	98.6	Cloudy	1.50	2.31	0.25
0641		14.99	15.77	11251	5.43	55.3	1.17	91.1	Cloudy	2.25	3.31	0.25
0644		14.96	15.82	11270	5.43	46.6	1.04	100.2	Cloudy	3.00	4.41	0.25
0647		14.94	15.80	11281	5.42	44.7	0.98	101.4	Cloudy	3.75	5.51	0.25
0648	End Purge											
0655	Sample											

Fe+2 (ppm) — Taken immediately before sampling.

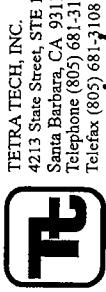
WATER LEVEL (ft btoc) AT TIME OF SAMPLING: 14.46

Comments: \_\_\_\_\_

PARAMETERS FOR WATER QUALITY STABILIZATION			
Temperature	$\pm 1^\circ \text{C}$ (1.8 F)	Conductivity	$\pm 5\%$
pH	$\pm 0.1$	Turbidity	5 NTUs

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities and the PID readings will be recorded in the logbook.





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GROUNDWATER MONITORING WELL  
FIELD DATA LOG SHEET - PURGING

DATE 8/2/05

PROGRAM NAME B6MP

MONITORING WELL IDENTIFICATION V2 NW 5

SAMPLE I.D. 21.49

STATIC WATER LEVEL (ft btoc) 22.91

WATER COLUMN (feet) 2.49

PUMP & TUBING (V) (L) 3 V (L)

SITE NUMBER 2

TOTAL WELL DEPTH (ft btoc) 38

TUBING DIAMETER (in) 7.47

PID READING IN BREATHING ZONE (ppm) 44.4

PID READING IN CASING (ppm) (initial) —

(vented to) —

(initial) —

(vented to) —

PURGING DEVICE MICROPURGE DEDICATED PUMP

SAMPLING DEVICE MICROPURGE DEDICATED PUMP

PID READING IN CASING (ppm) (initial) —

(vented to) —

(initial) —

(vented to) —

SAMPLER'S SIGNATURE Brian S. Gove

DATE 8/2/05

TIME ACTIVITY

WATER LEVEL (ft btoc)

TEMP (Deg. C)

EC (µmhos/cm)

pH

TURBIDITY (NTU)

DISSOLVED OXYGEN (mg/L)

ORP (mV)

Color

Volume Purged (L)

PUMP & TUBING VOLUMES PURGED

FLOW RATE (LPM)

12:23 Begin Purge

21.65 22.70 9512 5.78 7.97 3.37 39.1 clear 0.0 0.80

12:38 21.71 21.92 9397 5.94 10.2 2.86 90.1 Clear 3.0 1.20

12:43 21.71 21.79 9377 5.95 5.52 2.63 101.5 clear 4.0 1.60

12:48 21.71 21.66 9344 5.95 3.77 2.48 104.2 clear 5.0 2.00

12:50 End Purge

12:55 Sample 21.73 —

13:00 Filter Sample

F=+2 (ppm) — Taken immediately before sampling.

WATER LEVEL (ft btoc) AT TIME OF SAMPLING: 21.73

Comments: (32.36 divided by 2 gives 11.03

BT-D = 32.77 subtract 11.03 = 21.99 static water level

Water levels are off ox due to concrete system @ 10 ft.

X:\TRP\DriveP:\Field\Workfield\CoordinateForms.xls b8

PARAMETERS FOR WATER QUALITY STABILIZATION

Temperature  $\pm 1^\circ \text{C}$  ( $1.8^\circ \text{F}$ )

Conductivity  $\pm 5\%$

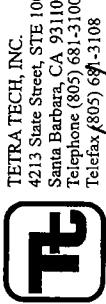
pH  $\pm 0.1$

Turbidity 5 NTUs

Note: All water levels and pump depths are measured from the porch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities and the PID readings will be recorded in the logbook.







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GROUNDWATER MONITORING WELL  
FIELD DATA LOG SHEET - PURGING

Page 1 of 1

DATE 8/2/05 SITE NUMBER 2

PROGRAM NAME B6mp

MONITORING WELL IDENTIFICATION

U2 MW 9

DUPPLICATE I.D. 2 - MW-9

STATIC WATER LEVEL (ft btoc) 23.33

TOTAL WELL DEPTH (ft btoc) 45.20

WATER COLUMN (feet) 21.90

TUBING DIAMETER (in) 3/8

PUMP & TUBING (V) (L) 2.01

3 V (L) 6.03

Time	Activity	Water Level (ft btoc)	Temp (Deg. C)	EC (µmhos/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (L)	Pump & Tubing Volumes Purged	Flow Rate (LPM)
0929	<u>Begin Purge</u>	<u>23.76</u>	<u>22.52</u>	<u>13.44</u>	<u>6.39</u>	<u>25.8</u>	<u>6.34</u>	<u>133.2</u>	<u>Clear</u>	<u>1.4</u>	<u>0.69</u>	
0944		<u>23.81</u>	<u>22.65</u>	<u>13.71</u>	<u>5.03</u>	<u>24.8</u>	<u>8.91</u>	<u>139.8</u>	<u>Clear</u>	<u>2.1</u>	<u>1.05</u>	
0949		<u>23.86</u>	<u>22.64</u>	<u>13.74</u>	<u>5.95</u>	<u>5.2</u>	<u>8.67</u>	<u>140.9</u>	<u>Clear</u>	<u>2.8</u>	<u>1.39</u>	
0954		<u>23.89</u>	<u>22.70</u>	<u>13.77</u>	<u>5.90</u>	<u>1.4</u>	<u>8.05</u>	<u>136.9</u>	<u>Clear</u>	<u>3.5</u>	<u>1.74</u>	
0959		<u>23.91</u>	<u>23.01</u>	<u>13.91</u>	<u>5.84</u>	<u>6.75</u>	<u>7.60</u>	<u>136.4</u>	<u>Clear</u>	<u>4.2</u>	<u>2.09</u>	
1004		<u>23.92</u>	<u>23.20</u>	<u>13.95</u>	<u>5.81</u>	<u>5.27</u>	<u>7.33</u>	<u>139.9</u>	<u>Clear</u>	<u>4.9</u>	<u>2.43</u>	
1009		<u>23.85</u>	<u>23.31</u>	<u>13.98</u>	<u>5.80</u>	<u>4.65</u>	<u>7.12</u>	<u>140.4</u>	<u>Clear</u>	<u>5.6</u>	<u>2.78</u>	
1010	<u>End Purge</u>											
1020	<u>Sample</u>	<u>23.83</u>										
1025	<u>Filter Sample</u>											

Fe+2 (ppm) — Taken immediately before sampling.

WATER LEVEL (ft btoc) AT TIME OF SAMPLING: 23.83

Comments: 129.34 divided by 12 gives feet = 10.78'

SI D = 34.11 Subtract 10.78 = 33.33' static.

PARAME

ETERS FOR WATER QUALITY STABILIZATION

Temperature  $\pm 1$  C (1.8 F) Conductivity  $\pm 5\%$   
pH  $\pm 0.1$  Turbidity 5 NTUs

X:\IRP\DriveField\WorkField\CoordinateForms.xls

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities and the PID readings will be recorded in the logbook.



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GROUNDWATER MONITORING WELL  
FIELD DATA LOG SHEET - PURGING

Page 1 of 1

DATE 8/1/05 SITE NUMBER 2

PROGRAM NAME B6mp

MONITORING WELL IDENTIFICATION 2-MW-10

SAMPLE I.D. V3AW10F

STATIC WATER LEVEL (ft btoc) 27.50

WATER COLUMN (feet) 26.2

PUMP & TUBING (V) (L) 0.87

TUBING DIAMETER (in) 3/8

3 V (L) 3.61

		PURGING DEVICE		MICROPURGE DEDICATED PUMP	
		SAMPLING DEVICE		MICROPURGE DEDICATED PUMP	
PID READING IN CASING (ppm)		(initial) <u>0.0</u>	(vented to) <u>0.0</u>		
PID READING IN BREATHING ZONE (ppm)		(initial) <u>0.0</u>	(vented to) <u>0.0</u>		

DUPLICATE I.D. —

TOTAL WELL DEPTH (ft btoc) 53.7

SAMPLER'S SIGNATURE M. M. M. M.

Time	Activity	Water Level (ft btoc)	Temp (Deg. C)	EC (µmhos/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (L)	Pump & Tubing Volumes Purged	Flow Rate (LPM)
1453	RELIN PURGE	28.18	20.68	1252	6.18	75.8	1.34	-93.6	CLOUDY	0.46	1.03	0.30
1456	RELIN PURGE	28.31	20.86	8891	6.01	67.6	1.00	-111.3	CLOUDY	1.80	2.07	0.30
1502	RELIN PURGE	28.60	20.71	8561	6.01	65.4	0.64	-128.2	CLOUDY	2.70	3.10	0.30
1505	RELIN PURGE	28.72	20.73	8481	6.01	64.1	0.44	-138.5	CLOUDY	3.60	4.14	0.30
1508	RELIN PURGE	28.45	20.66	8364	6.01	67.2	0.24	-151.0	CLOUDY	4.50	5.17	0.30
1509	END PURGE	—	—	—	—	—	—	—	—	—	—	—
1515	SAMPLE	—	—	—	—	—	—	—	—	—	—	—

Ft+2 (ppm) —

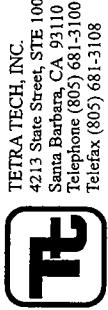
Taken immediately before sampling

WATER LEVEL (ft btoc) AT TIME OF SAMPLING: 26.06

Comments: \_\_\_\_\_

PARAMETERS FOR WATER QUALITY STABILIZATION			
Temperature $\pm 1^\circ \text{C}$ (1.8 F)	Conductivity $\pm 5\%$		
pH $\pm 0.1$	Turbidity 5 NTUs		

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities and the PID readings will be recorded in the logbook.



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GROUNDWATER MONITORING WELL  
FIELD DATA LOG SHEET - PURGING

Page 1 of 1

DATE 8/3/05

PROGRAM NAME Blimp

SITE NUMBER 1

PURGING DEVICE

MICROPURGE DEDICATED PUMP

MONITORING WELL IDENTIFICATION 2-Mw-11

SAMPLING DEVICE

MICROPURGE DEDICATED PUMP

SAMPLE I.D. V1mwlF

DUPPLICATE I.D. —

PID READING IN CASING (ppm)

(initial) 3.7 (vented to) 0.0

STATIC WATER LEVEL (ft btoc) 30.59

TOTAL WELL DEPTH (ft btoc) 54.9

PID READING IN BREATHING ZONE (ppm)

(initial) 0.0 (vented to) 0.0

WATER COLUMN (feet) 24.4

TUBING DIAMETER (in) 0.87

PUMP & TUBING (V) (L) 3 V (L)

3.61

Time 1140 Activity BEGIN PURGE

Water Level (ft btoc) 31.04

Temp (Deg. C) 16.49

EC (µmhos/cm) 12633

pH 6.56

Turbidity (NTU) 2.52

Dissolved Oxygen (mg/L) 3.55

ORP (mV) 23.6

Color CLEAR

VOLUME PURGED (L) —

Flow Rate (L/PM) 0.20

Time 1144 Activity END PURGE

Water Level (ft btoc) 31.14

Temp (Deg. C) 16.44

EC (µmhos/cm) 13103

pH 6.42

Turbidity (NTU) 1.83

Dissolved Oxygen (mg/L) 3.03

ORP (mV) 23.0

Color CLEAR

VOLUME PURGED (L) —

Flow Rate (L/PM) 0.20

Time 1146 Activity END PURGE

Water Level (ft btoc) 31.21

Temp (Deg. C) 16.69

EC (µmhos/cm) 13274

pH 6.30

Turbidity (NTU) 2.56

Dissolved Oxygen (mg/L) 2.55

ORP (mV) 26.1

Color CLEAR

VOLUME PURGED (L) —

Flow Rate (L/PM) 0.20

Time 1148 Activity END PURGE

Water Level (ft btoc) 31.40

Temp (Deg. C) 16.82

EC (µmhos/cm) 13355

pH 6.20

Turbidity (NTU) 2.31

Dissolved Oxygen (mg/L) 1.96

ORP (mV) 28.4

Color CLEAR

VOLUME PURGED (L) —

Flow Rate (L/PM) 0.20

Time 1150 Activity END PURGE

Water Level (ft btoc) 31.50

Temp (Deg. C) 16.67

EC (µmhos/cm) 13337

pH 6.14

Turbidity (NTU) 2.24

Dissolved Oxygen (mg/L) 1.63

ORP (mV) 32.1

Color CLEAR

VOLUME PURGED (L) —

Flow Rate (L/PM) 0.20

Time 1154 Activity END PURGE

Water Level (ft btoc) 31.54

Temp (Deg. C) 16.59

EC (µmhos/cm) 13308

pH 6.12

Turbidity (NTU) 2.24

Dissolved Oxygen (mg/L) 1.52

ORP (mV) 33.0

Color CLEAR

VOLUME PURGED (L) —

Flow Rate (L/PM) 0.20

Time 1156 Activity END PURGE

Water Level (ft btoc) 31.57

Temp (Deg. C) 16.59

EC (µmhos/cm) 13308

pH 6.12

Turbidity (NTU) 2.24

Dissolved Oxygen (mg/L) 1.52

ORP (mV) 33.0

Color CLEAR

VOLUME PURGED (L) —

Flow Rate (L/PM) 0.20

Time 1157 Activity END PURGE

Water Level (ft btoc) 31.60

Temp (Deg. C) 16.60

EC (µmhos/cm) 13308

pH 6.12

Turbidity (NTU) 2.24

Dissolved Oxygen (mg/L) 1.52

ORP (mV) 33.0

Color CLEAR

VOLUME PURGED (L) —

Flow Rate (L/PM) 0.20

Time 1158 Activity END PURGE

Water Level (ft btoc) 31.61

Temp (Deg. C) 16.61

EC (µmhos/cm) 13308

pH 6.12

Turbidity (NTU) 2.24

Dissolved Oxygen (mg/L) 1.52

ORP (mV) 33.0

Color CLEAR

VOLUME PURGED (L) —

Flow Rate (L/PM) 0.20

Time 1159 Activity END PURGE

Water Level (ft btoc) 31.62

Temp (Deg. C) 16.62

EC (µmhos/cm) 13308

pH 6.12

Turbidity (NTU) 2.24

Dissolved Oxygen (mg/L) 1.52

ORP (mV) 33.0

Color CLEAR

VOLUME PURGED (L) —

Flow Rate (L/PM) 0.20

Time 1160 Activity SAMPLE

Water Level (ft btoc) 31.63

Temp (Deg. C) 16.63

EC (µmhos/cm) 13308

pH 6.13

Turbidity (NTU) 2.24

Dissolved Oxygen (mg/L) 1.52

ORP (mV) 33.0

Color CLEAR

VOLUME PURGED (L) —

Flow Rate (L/PM) 0.20

Time 1161 Activity END PURGE

Water Level (ft btoc) 31.64

Temp (Deg. C) 16.64

EC (µmhos/cm) 13308

pH 6.14

Turbidity (NTU) 2.24

Dissolved Oxygen (mg/L) 1.52

ORP (mV) 33.0

Color CLEAR

VOLUME PURGED (L) —

Flow Rate (L/PM) 0.20

Time 1162 Activity END PURGE

Water Level (ft btoc) 31.65

Temp (Deg. C) 16.65

EC (µmhos/cm) 13308

pH 6.15

Turbidity (NTU) 2.24

Dissolved Oxygen (mg/L) 1.52

ORP (mV) 33.0

Color CLEAR

VOLUME PURGED (L) —

Flow Rate (L/PM) 0.20

Time 1163 Activity END PURGE

Water Level (ft btoc) 31.66

Temp (Deg. C) 16.66

EC (µmhos/cm) 13308

pH 6.16

Turbidity (NTU) 2.24

Dissolved Oxygen (mg/L) 1.52

ORP (mV) 33.0

Color CLEAR

VOLUME PURGED (L) —

Flow Rate (L/PM) 0.20

Time 1164 Activity END PURGE

Water Level (ft btoc) 31.67

Temp (Deg. C) 16.67

EC (µmhos/cm) 13308

pH 6.17

Turbidity (NTU) 2.24

Dissolved Oxygen (mg/L) 1.52

ORP (mV) 33.0

Color CLEAR

VOLUME PURGED (L) —

Flow Rate (L/PM) 0.20

Time 1165 Activity END PURGE

Water Level (ft btoc) 31.68

Temp (Deg. C) 16.68

EC (µmhos/cm) 13308

pH 6.18

Turbidity (NTU) 2.24

Dissolved Oxygen (mg/L) 1.52

ORP (mV) 33.0

Color CLEAR

VOLUME PURGED (L) —

Flow Rate (L/PM) 0.20

Time 1166 Activity END PURGE

Water Level (ft btoc) 31.69

Temp (Deg. C) 16.69

EC (µmhos/cm) 13308

pH 6.19

Turbidity (NTU) 2.24

Dissolved Oxygen (mg/L) 1.52

ORP (mV) 33.0

Color CLEAR

VOLUME PURGED (L) —

Flow Rate (L/PM) 0.20

Time 1167 Activity END PURGE

Water Level (ft btoc) 31.70

Temp (Deg. C) 16.70

EC (µmhos/cm) 13308

pH 6.20

Turbidity (NTU) 2.24

Dissolved Oxygen (mg/L) 1.52

ORP (mV) 33.0

Color CLEAR

VOLUME PURGED (L) —

Flow Rate (L/PM) 0.20

Time 1168 Activity END PURGE

Water Level (ft btoc) 31.71

Temp (Deg. C) 16.71

EC (µmhos/cm) 13308

pH 6.21

Turbidity (NTU) 2.24

Dissolved Oxygen (mg/L) 1.52

ORP (mV) 33.0

Color CLEAR

VOLUME PURGED (L) —

Flow Rate (L/PM) 0.20

Time 1169 Activity END PURGE

</div





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**GROUNDWATER MONITORING WELL  
FIELD DATA LOG SHEET - PURGING**

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Taken immediately before sampling.

WATER LEVEL (ft b.t.o.c) AT TIME OF SAMPLING: **35 46**

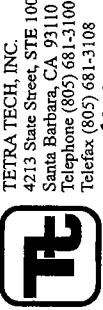
\* EC value at  
Comments:

\* EC value not consistent with comments:

Highly inflated price from business valency. 11.2.01

PARAMETERS FOR WATER QUALITY STABILIZATION			
Temperature	$\pm 1^\circ\text{C}$ (1.8 F)	Conductivity	$\pm 5\%$
pH	$\pm 0.1$	Turbidity	5 NTUs

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities and the PID readings will be recorded in the logbook.



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GROUNDWATER MONITORING WELL  
FIELD DATA LOG SHEET - PURGING

Page 1 of 1

DATE	PROGRAM NAME	SITE NUMBER	PURGING DEVICE	MICROPURGE DEDICATED PUMP								
<u>8/13/05</u>	<u>B6MP</u>	<u>OS-AW-2</u>	<u>SAMPLING DEVICE</u>	<u>MICROPURGE DEDICATED PUMP</u>								
MONITORING WELL IDENTIFICATION			PID READING IN CASING (ppm)	(initial) <u>0.0</u> (vented to) <u>0.0</u>								
SAMPLE I.D.	<u>OSMWW2M</u>	DUPPLICATE I.D. <u>—</u>	PID READING IN BREATHING ZONE (ppm)	(initial) <u>0.0</u> (vented to) <u>0.0</u>								
STATIC WATER LEVEL (ft btoc)	<u>20.22</u>	TOTAL WELL DEPTH (ft btoc)	<u>45.6</u>									
WATER COLUMN (feet)	<u>25.4</u>	TUBING DIAMETER (in)	<u>3/8</u>									
PUMP & TUBING (V) (L)	<u>0.76</u>	3 V (L)	<u>2.18</u>									
Time	Activity	Water Level (ft btoc)	Temp (Deg. C)	EC (µmhos/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (L)	Pump & Tubing Volumes Purged	Flow Rate (L/PM)
<u>1030</u>	<u>REACH PURPLE</u>	<u>—</u>	<u>18.10</u>	<u>3376</u>	<u>6.81</u>	<u>8.34</u>	<u>1.21</u>	<u>-36.4</u>	<u>Yellowish</u>	<u>0.90</u>	<u>1.18</u>	<u>6.30</u>
<u>1033</u>	<u>REACH PURPLE</u>	<u>—</u>	<u>18.16</u>	<u>3483</u>	<u>6.42</u>	<u>3.62</u>	<u>0.47</u>	<u>-42.7</u>	<u>Yellowish</u>	<u>1.80</u>	<u>2.37</u>	<u>0.30</u>
<u>1036</u>	<u>REACH PURPLE</u>	<u>—</u>	<u>18.33</u>	<u>2638</u>	<u>7.04</u>	<u>1.91</u>	<u>0.67</u>	<u>-50.4</u>	<u>Yellowish / Greenish</u>	<u>2.70</u>	<u>3.55</u>	<u>0.30</u>
<u>1039</u>	<u>REACH PURPLE</u>	<u>—</u>	<u>18.53</u>	<u>2521</u>	<u>7.11</u>	<u>1.82</u>	<u>0.55</u>	<u>-57.4</u>	<u>Yellowish / Greenish</u>	<u>3.60</u>	<u>4.74</u>	<u>0.30</u>
<u>1042</u>	<u>REACH PURPLE</u>	<u>—</u>	<u>18.53</u>	<u>2443</u>	<u>7.11</u>	<u>1.87</u>	<u>0.46</u>	<u>-63.7</u>	<u>Yellowish / Greenish</u>	<u>4.50</u>	<u>5.62</u>	<u>0.30</u>
<u>1045</u>	<u>END PURPLE</u>	<u>—</u>										
<u>1050</u>	<u>SAMPLE</u>	<u>—</u>										
F+2 (ppm)	<u>—</u>	Taken immediately before sampling.										
WATER LEVEL (ft btoc) AT TIME OF SAMPLING:	<u>20.53</u>											
Comments:												

X:\TRP\PrivateField\Workfield\CoordinationForms\at.bgl		
PARAMETERS FOR WATER QUALITY STABILIZATION	Temperature $\pm 1$ C (1.8 F)	Conductivity $\pm 5\%$
Temperature $\pm 0.1$	pH	Turbidity 5 NTUS

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities and the PID readings will be recorded in the logbook.

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## **APPENDIX B**

## **CHAIN-OF-CUSTODY RECORDS**



4213 State Street, Suite 100  
Santa Barbara, CA 93110  
Phone (805) 681-3100  
FAX (805) 681-3108

SHIPPED TO: \_\_\_\_\_ EMAX Labs  
1835 West 205th Street  
Innverne, CA 90501

**CHAIN OF CUSTODY RECORD**

SHIPPED TO: \_\_\_\_\_  
EMAX Labs  
1835 West 205th Street  
Torrance CA 90501

Torrance CA 90501

Conder #1 T = 2.2  
Conder #2 T = 3.2  
Cerler #3 T = 3.5°C



**TETRA TECH, INC.**  
4213 State Street, Suite 100  
Santa Barbara, CA 93110  
Phone (805) 681-3100  
FAX (805) 681-3108

SHIPPED TO: EMAX Labs

1835 West 205th Street  
Torrance, CA 90501

## CHAIN OF CUSTODY RECORD

J3/vwo1-#2

CLIENT	Vandenberg AFB	ANALYTICAL METHODS	SITE	2	DATE	8/2/05	PAGE 1 OF 1
PROJECT NAME	BGMP						TURN-AROUND TIME: Standard
PROJECT MANAGER	Kevin McNamara						OBSERVATIONS/COMMENTS:
TC#	T99105-06						
SAMPLERS (Signatures)	Matt Fletcher Jefferson Cain						
SAMPLE NO.	DATE	TIME					
1 V2HW5F	8/2/05	1300					
2 V2HW5		1255					
3 V2HW7F V2HW7F		1410					
4 V2HW7		1445					
5 V2HW8F		125					
6 V2HW8		120					
7 V2HW9F		1025					
8 V2HW9		1020					
9 V2TB1068		V 0805					
MATRIX TYPE:	S = Soil W = Water SD = Sediment	CONTAINER TYPE:	G = Glass SS = Stainless Steel P = Plastic	PRESERVATIVES:			
RELINQUISHED BY:	Matt Fletcher	SIGNATURE:		TETRA TECH, INC.	DATE: 8/13/05	TIME: 11:00	TOTAL NUMBER OF CONTAINERS: 32 of 32
REINQUI舍ED BY:	Jefferson Cain	SIGNATURE:		COMPANY: EMAX	DATE: 8. 3. 05	TIME: 11:00	METHOD OF SHIPMENT: Courier
RELINQUISHED BY:	Matt Fletcher	SIGNATURE:		COMPANY: EMAX	DATE: 8. 3 05	TIME: 13:00	SPECIAL SHIPMENT/HANDLING/STORAGE REQUIREMENTS: store at 3°C
RECEIVED BY:	Jefferson Cain	SIGNATURE:		COMPANY: EMA	DATE: 8-3-05	TIME: 13:00	

① T = 3.4°C ② T = 3.8°C ③ T = 3.5°C



TETRA TECH, INC.

4213 State Street, Suite 100  
 Santa Barbara, CA 93110  
 Phone (805) 681-3100  
 FAX (805) 681-3108

SHIPPED TO:  
 EMAX Labs  
 1835 West 205th Street

Torrance, CA 90501

## CHAIN OF CUSTODY RECORD

J2/VWV1-08

CLIENT	Vandenberg AFB	SITE	2	DATE	8/3/05	PAGE	1 OF 1
PROJECT NAME	BGMP	ANALYTICAL METHODS	OBSERVATIONS/COMMENTS:				
PROJECT MANAGER	Kevin McNamara						
TC#	T99105-06						
SAMPLERS (Signatures)	<i>Mel M. Mathis</i> <i>Ronald Besser</i>						
SAMPLE NO.		DATE	TIME				
1 V2T81070	8/3/05	0805					
2 V2Mw1		0955					
3 V2Mw1F		1000					
4 V2Mw11F		1200					
5 V2Mw12F		1245					
6 V2Mw2M		1050					
7 V2Mw4F		1055					
8 V2Mw547		1700					
9 V2Mw547F		1705					
MATRIX TYPE:	S = Soil W = Water SD = Sediment	CONTAINER TYPE:	G = Glass SS = Stainless Steel P = Plastic	PRESERVATIVES:	All samples are preserved at 4°C. Water samples are preserved as indicated on the sample labels.	TEMPERATURE BLANK EACH COOLER:	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
RELINQUISHED BY:	<i>Erica Davis</i>	SIGNATURE:	<i>Erica Davis</i>	COMPANY:	TETRA TECH, INC.	DATE:	8/4/05
RETRIEVED BY:	<i>John Fletcher</i>	SIGNATURE:	<i>John Fletcher</i>	COMPANY:	EMAX	DATE:	8-4-05
RETRIEVED BY:	<i>John Fletcher</i>	SIGNATURE:	<i>John Fletcher</i>	COMPANY:	EMAX	DATE:	8.4.05
RECEIVED BY:	<i>INDRA PATER</i>	SIGNATURE:	<i>INDRA PATER</i>	COMPANY:	Conex	DATE:	8-4-05
						TIME:	11:15
						TIME:	11:15
						TIME:	13:30
						TIME:	13:30
						TOTAL NUMBER OF CONTAINERS	3

Container #1 T = 3.2°C  
 Container #2 T = 2.8°C

Container #3 T = 1.5°C  
 Container #4 T = 2.2°C

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## **APPENDIX C**

## **SUPPORTING TABLES**

Table C-1  
**Summary of SVOCs and PAHs**  
**EPA Methods SW8270C and**  
**SW8270C SIM (µg/L)**  
**IRP Site 2 (Old Base Service Station)**  
**Vandenberg AFB, California**

	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02	Spr-02	Sum-02	Fall-02	Win-03	Spr-03	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05
2-MW-1	NA	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
2-MW-3	ND	ND	ND	ND																
2-MW-5	ND	ND	ND	ND																
2-MW-6	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	ND	ND	ND	ND																
2-MW-8	ND	ND	ND	ND																
2-MW-9	ND	ND	ND	ND																
2-MW-10	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-11	NA	NA	NA	NA																
2-MW-12	NA	NA	NA	NA																
OS-MW-1	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
OS-MW-2	NA	NA	ND	ND	NA	ND	NA	ND												

	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02	Spr-02	Sum-02	Fall-02	Win-03	Spr-03	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05
2-MW-1	NA	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
2-MW-3	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
2-MW-5	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
2-MW-6	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
2-MW-8	ND	ND	ND	ND	ND	ND	5.7	23	ND	21	ND	28	21.3	25.1	32.0	38.2	9.5	25	21	18
2-MW-9	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
2-MW-10	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-11	NA	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-12	NA	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
OS-MW-2	NA	NA	ND	ND	NA	ND	NA	ND												

Table C-1  
 Summary of SVOCs and PAHs  
 EPA Methods SW8270C and  
 SW8270C SIM (µg/L)  
 IRP Site 2 (Old Base Service Station)  
 Vandenberg AFB, California

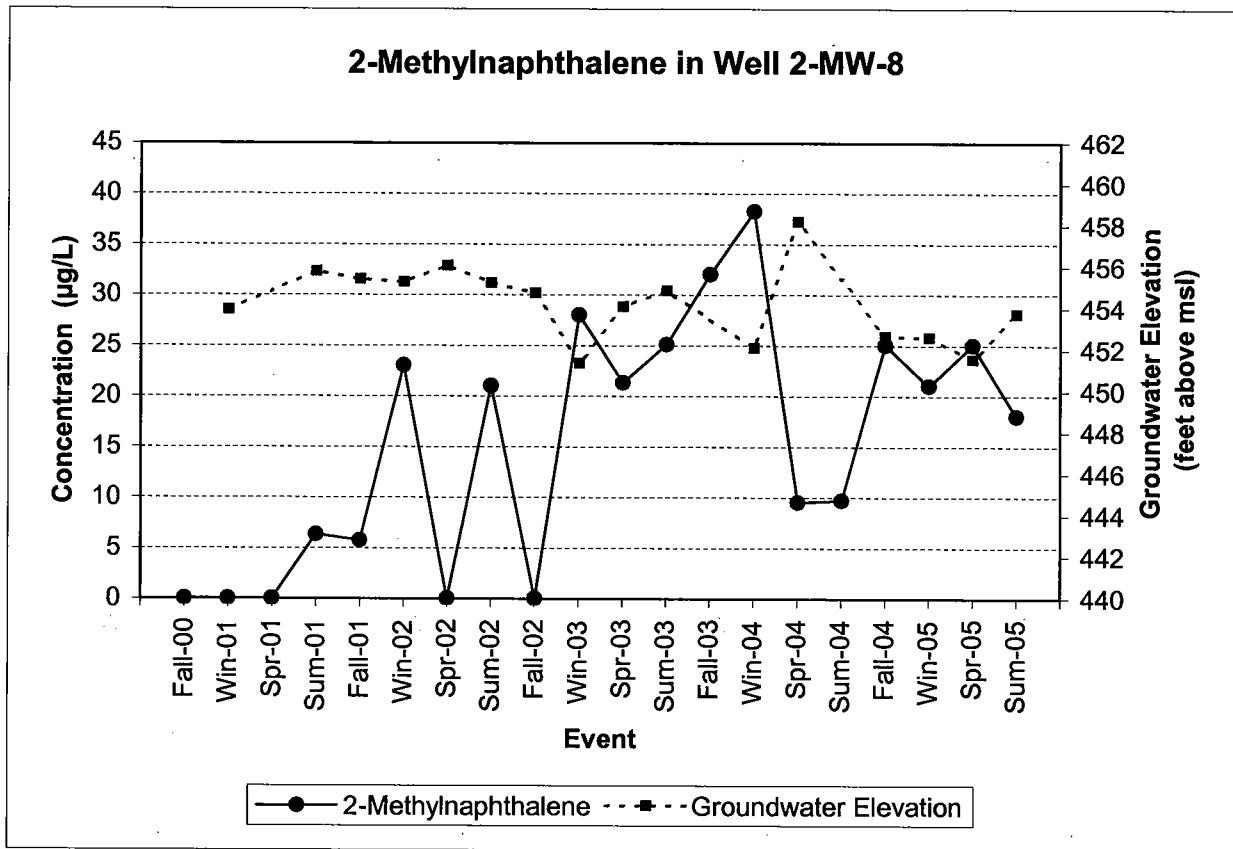
	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02	Spr-02	Sum-02	Fall-02	Win-03	Spr-03	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05
2-MW-1	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
2-MW-3	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
2-MW-5	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
2-MW-6	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
2-MW-8	ND	ND	NA	5.3	ND	21	10	18	12	16	15.2	18.5	25.7	28.8	9.7	9.2	21	17	22	16
2-MW-9	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
2-MW-10	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-11	NA	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-12	NA	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND
OS-MW-2	NA	NA	ND	ND	ND	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND

Naphthalene <sup>a</sup> (by SW8270C SIM)						Indeno[1,2,3-cd]pyrene (by SW8270C SIM)					
	Fall-04	Win-05	Spr-05	Sum-05		Fall-04	Win-05	Spr-05	Sum-05		
2-MW-8	14	15	18	11		2-MW-8				ND	ND
OS-MW-2	ND	ND	NA	ND	OS-MW-2	ND	ND	NA	ND	ND	ND

Definition(s):

µg/L - micrograms per liter  
 NA - not analyzed  
 ND - not detected; result is less than the method detection limit

Note(s):  
 a - The California Department of Health Services (DHS) notification level for naphthalene is 17 µg/L.



**Figure C-1. Historic concentrations of 2-Methylnaphthalene in Groundwater from well 2-MW-8.**  
The compound has only been detected in groundwater from well 2-MW-8.